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NORTH PACIFIC PILOT: PART II.

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THE SEAMAN'S GUIDE

TO THE

ISLANDS

OF THE

NORTH PACIFIC,

WITH AN

APPENDIX ON THE WINDS, WEATHER, CURRENTS, &c.,

OF THE

NORTH AND SOUTH PACIFIC.

BY W. H. ROSSER,

AUTHOR OF THE "SELF-INSTRUCTOR IN NAVIGATION;" "THE STARS, HOW TO KNOW THEM, ETC.," ETC. ETC.



LONDON:  
JAMES IMRAY AND SON,  
MINORIES AND TOWER HILL.

1870.

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*N.B.—North Pacific Pilot, Part I., includes "Sailing Directions for the West Coast of North America between Panama and Queen Charlotte Islands,"*  
*by J. F. IMRAY, F.R.G.S.*

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## PREFACE.

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LAST year Messrs. IMRAY and SON published "Sailing Directions for the West Coast of North America between Panama and Queen Charlotte islands" by J. F. IMRAY, F.R.G.S., which constitutes Part I. of the "NORTH PACIFIC PILOT." The present work, which includes a Description of, and Sailing Directions for, the Islands of that ocean, forms Part II. of the same "Pilot,"—being at once a *sequel* to the former publication, and yet *independent* of it so far as the Navigation of the Islands only is concerned.

In the compilation of Part II., which includes every known Island of the North Pacific between Lat. 50° N. and the Equator, all sources of information—from the works of the old navigators to those of the present day—have been laid under contribution, including the voyages of DAMPIER, ANSON, COOK, VANCOUVER, LA PEROUSE, BOUGAINVILLE, BROUGHTON, PORTLOCK, MEARES, MORRELL, KOTZEBUE, LUTKE, FREYCINET, DUPERREY, D'URVILLE, BEECHY, SIR E. BELCHER, CHEYNE, and Commodores WILKES and PERRY of the U.S. Navy, —together with the Annales Maritimes, Annales Hydrographiques, Anuario de la Direccion de Hidrografia, the Journal of the Royal Geographical Society, the Nautical Magazine, and the Mercantile Marine Magazine, &c. &c.

In addition to the *well known* Islands, Rocks, Shoals, &c, here fully described, every *reported danger* of any kind soever has been carefully collected together and collated for the Mariner's guidance, to the end that he may either verify or repudiate its existence; and in this respect the Publishers will be obliged by any information tending to establish what is at present but vague conjecture, or otherwise, that they may be enabled to expunge from their charts many of those *vigias* which, as was formerly the case with the North Atlantic chart, are merely names without substance.

Most if not all the Islands, Rocks, and Shoals indicated in *italics* are of an uncertain character, and the locality of many of them has been examined or passed over by

different navigators at some time or other ; these might have been omitted, but as this is the first work published in England in which *all the North Pacific vigias* have been recorded, it has been thought better to include them on this occasion in the body of the text, and within the area to which they belong ; in a future edition they may be collected together and stand apart from the rest of the Islands, &c.

A copious Index will advise the Navigator as to all known Islands, Ports, Harbours, Anchorages, Rocks, Shoals, &c :—the nameless vigias are merely grouped within certain areas, respecting which the contents will be sufficient guide.

W. H. R.

LONDON, *February*, 1870.

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# ISLANDS

## IN THE

# NORTH PACIFIC OCEAN.

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### HAWAIIAN ARCHIPELAGO OR SANDWICH ISLANDS.

THE **HAWAIIAN ARCHIPELAGO**—SANDWICH ISLANDS of COOK—lies between lat.  $18^{\circ} 52'$  and  $22^{\circ} 15'$  N., and between long.  $154^{\circ} 42'$  and  $160^{\circ} 33'$  W., stretching in a general W.N.W. and E.S.E direction about 340 miles; within that distance it consists of eight large islands, and four islets which are scarcely more than barren rocks,—the entire group having an area of about 6100 square miles, and in 1866, containing a population of 62,959 persons, distributed among the various islands as follows—

Names of the Islands.	Area in sq. miles.	Population in 1866.		
		Native.	Foreign.	Total.
HAWAII (Owhyhee)* . . . .	4000 ...	19,226 ...	572 ...	19,798
MAUI (Mowee) . . . . .	620 ...	13,430 ...	606 ...	14,036
KAHULAU (Tahoorowa) . .	60			
LANAI (Ranai) . . . . .	110 ...	385 ...	9 ...	394
MOLOKAI (Morotoi) . . . .	190 ...	2,280 ...	29 ...	2,309
OAHU (Woahoo) . . . . .	530 ...	17,225 ...	2,574 ...	19,799
KAUAI (Atooi) . . . . .	500 ...	5,907 ...	392 ...	6,299
NIHAU (Oneeheow) . . . .	90 ...	312 ...	13 ...	325
Totals		58,765	4,194	62,959
MOLOKINI (Morokinne) . . . . .	}	Islets scarcely more than barren rocks.		
LEHUA (Oreehoua) . . . . .				
KAULA (Tahooro) . . . . .				
NIHOA, MODU-MANU, or BIRD island				

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\* The names in brackets are those given in Capt. COOK's Third Voyage.

**History of the Discovery of the Islands, and Progress of the People.**—In the old Spanish charts taken by ANSON from the Manila galleon there is a group of islands called Los Majos, the different members of which are termed La Mesa, La Desgraciada, Los Monjes, Rocca Partida, La Nublada, &c.; and they are placed between lat.  $18^{\circ}$  and  $22^{\circ}$  N., and between long.  $135^{\circ}$  and  $139^{\circ}$  W.; but their existence in that position—at least as regards longitude—was disproved by the subsequent voyages to the Pacific of LA PÉROUSE in 1786, of PORTLOCK and DIXON in 1786, and of VANCOUVER in 1793. The Spanish word *Mesa*, however, signifies *table*, and is sufficiently indicative of the island of Hawaii, the mountains of which do not, like most volcanoes, rise into peaks, but are “flat at the top, making what is called by mariners *table-land*,” while other points of coincidence—such as an island-group extending through four degrees of latitude and longitude, the position as regards latitude nearly correct, &c.,—would seem to refer to what is now called the Hawaiian archipelago. The discrepancy as regards longitude (nearly twenty degrees) counts for little where *dead-reckoning* was the means employed to determine that element; as great an error was made by the Hon. E.I. Co.’s ship *Derby* in 1719 proceeding from the Cape of Good Hope to India, when the islands off the west coast of Sumatra were thought to be the Maldivhs.\*

The positions given above are, according to various authorities, those in which the Spaniards placed the islands of Los Majos; but from a note, p. 116, in the second volume of “*Voyage de LA PÉROUSE autour du Monde, rédigé par M. L. A. MILET-MUREAU*,” published in Paris in 1797, it appears,—that GAETANO in 1542 sailed from Navidad on the west coast of Mexico (lat.  $20^{\circ}$  N.); he steered a due west course for 900 leagues, when he discovered a group of islands inhabited by savages nearly naked; the islands were fringed with coral, and grew cocoa-nuts and other fruit; there was neither gold nor silver; he named them *Islas del Rey*; the island 20 leagues more to the west he called *Isla de las Huertas*. It is also stated that the Spanish editor of GAETANO’s account placed the islands between  $9^{\circ}$  and  $11^{\circ}$  N., a clerical error for  $19^{\circ}$  and  $21^{\circ}$ .—Now Navidad is in lat.  $19^{\circ} 10'$  N., long.  $104^{\circ} 40'$  W.; 900 leagues in lat.  $19\frac{1}{2}^{\circ}$  is  $2864'$  diff. long. (or  $47^{\circ} 44'$ ), which added to the long. of Navidad gives  $152^{\circ} 24'$ , or  $2\frac{1}{2}$  degrees short of the long. of the nearest point of Hawaii,—but  $5\frac{1}{2}$  degrees short of the long. of Oahu,—and the next island (Kauai) is 60 miles or 20 leagues distant. Thus, if the information conveyed in the note to LA PÉROUSE’s “*Voyage*” is correct, it is more than probable that GAETANO *did* visit the Sandwich islands; but it is extraordinary, as COOK observes, that considering their favourable position, the Spanish galleons did not visit them.

There is no question, however, that these islands were first made generally known

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\* Capt. COOK did not hold the opinion that the Sandwich islands were known to the Spaniards; he says—“Had the Sandwich islands been discovered at an early period by the Spaniards there is little doubt that they would have taken advantage of so excellent a situation, and have made use of Atooi, or some of the other islands, as a refreshing place to the ships that sail annually from Acapulco for Manila. They lie almost midway between the first place and Guam, one of the Ladrone, which is at present their only port in traversing this vast ocean; and it would not have been a week’s sail out of their common route to have touched at them, which could have been done without running the least hazard of losing the passage, as they are sufficiently within the verge of the Easterly Trade wind.”

to Europeans by the third voyage of Capt. Cook. Our great navigator bound from Tahiti (Otaheite), subsequently discovered Christmas island, after which, resuming his course to the northward, he descried land at daybreak, January 18th, 1778; this was Atooi island, and he anchored in Wymoa bay on its S.W. side, January 20th.—On this occasion he saw Woahoo, Atooi, Oneeheow, Oreehoua, and Tahooro,—naming them the SANDWICH ISLANDS in honour of the then First Lord of the Admiralty. In February, 1778, COOK again made sail in the prosecution of discoveries to the northward, and after visiting the N.W. coast of North America returned to the Sandwich islands,—making Mowee on the morning of November 28th, 1778, and Owwhyhee in the evening of November 30th,—anchoring in Karakakoa bay on the west side of the latter island, January 17th, 1779.\*

It would be beyond our purpose to enter into a description of the manners, customs, and habits of the natives in COOK's time,†—suffice it to say he found chiefs and people alike willing to furnish all the required supplies at their disposal; they were respectful, friendly, and hospitable in the extreme, while he himself was received amidst various religious rites with evident marks of adoration. After such a reception he took his departure on February 4th; but in a gale on the 8th, the *Resolution* was disabled, and the ships returned to Karakakoa bay on the 11th. On this occasion from some unexplained cause a chief was killed, and several acts of petty theft being resented, there was now a manifestation of hostility rather than a continuance of the previous friendliness; a misunderstanding of motives and intentions speedily arising, led to a fatal conflict with the natives on shore, and the illustrious seaman was killed in the fray, February 14th, 1779.

Capt. CLERKE, on whom the command subsequently devolved, waited until he could induce the natives to give up COOK's bones,—for on his death they had mutilated and burnt the body; having attained this end he eventually left the bay on February 22nd. A reconnaissance was made of the islands of Tahoorowa, Mowee, Ranai, Morotoi, and Woahoo,—the vessels anchoring for a short time in Whymea bay, on the N.W. coast of the latter island; then proceeding to Atooi they again brought up in Wymoa bay, the first spot visited by COOK; having watered they weighed, March 8th, proceeding to Oneeheow, and finally quitted the Sandwich islands March 15th, 1779.

The next visitors to the Sandwich islands were PORTLOCK and DIXON in the *King George* and *Queen Charlotte*; they anchored in Karakakoa bay, May 26th, 1786; but finding the natives troublesome, they deemed it most prudent to get under weigh and carry on a running traffic for a few days. On June 1st anchorage was obtained in a bay on the south coast of Woahoo, near its S.E. point, and having taken in water and other stores, they proceeded to Oneeheow, bringing up in the bay

\* In the introductory notice of the islands (p. 3-5) the original names are preserved; the new names according to the Missionary orthography will be given as each island is described.

† For such particulars see "A Voyage to the Pacific Ocean undertaken by command of his Majesty, for making Discoveries in the Northern Hemisphere, performed under the direction of Captains COOK, CLERKE, and GORE, in H.M. ships the *Resolution* and *Discovery*, 1776, 1777, 1778, 1779, and 1780." Vols. i. and ii. by Capt. COOK, and vol. iii. by Capt. KING. See also VANCOUVER's "Voyage of Discovery to the North Pacific Ocean and Round the World, 1790-1795," in three vols.

on its west side which had been previously visited by COOK ; on this occasion they took their departure from the islands on June 13th ; but on two subsequent visits towards the end of 1786, and again in 1787, they called at most of the islands, and were received in a very friendly manner.

LA PÉROUSE appears to have been at the Sandwich islands about the same time as PORTLOCK and DIXON ; he brought up off the S.W. coast of Mowee, and after a stay of two days, during which time he appears to have been very favourably impressed with the disposition of the natives, he left, June 1st, 1786.

In the years 1786 and 1787 MEARES undertook a commercial voyage from Calcutta to the N.W. coast of America. In August, 1787, he visited the Sandwich islands, where he remained a month, "during which time the islanders appeared to have no other pleasure but what arose from showing kindness and exercising hospitality."

In 1788-1789, MEARES and DOUGLAS called there in the prosecution of a voyage similar to that previously undertaken by the former alone. MEARES brought up in Toe-yah-yah bay on the west side of Owhyhee, October 18th, 1788, and having procured a sufficiency of fresh provisions to last to China, departed for Atooi and Oneeheow, whence, having replenished his other stores, he took his farewell on the 27th of the month. DOUGLAS did not reach the islands till December, 1788 ; but he visited most of them during a four months stay, leaving on March 18th, 1789.

About this time the Sandwich islands began to be generally known and frequently resorted to ; but the most important visitor was VANCOUVER, who, on his voyage of discovery to the North Pacific Ocean and round the world, 1790-1795, called here on three occasions. On his second visit (in 1793), he brought with him cattle and sheep from California ; these he landed at Owhyhee, and obtained at the same time a promise from the principal chief or king, confirmed by a *taboo* (or sacred restriction) upon the new stock, that none should be killed during the space of ten years,—a promise which was faithfully kept. He also made most strenuous efforts to bring to a close the fatal wars then raging between the natives of Owhyhee and those of the other islands,—for as yet each island had its own ruler ; but though small success attended him in this direction, nevertheless the advice he gave, and the rules and regulations he proposed for adoption among them were such as to entitle him to be called their first Christian missionary.

On VANCOUVER's final departure in January, 1794, KAMEHAMEHA (the chief of Owhyhee) accomplished, in time and after a severe struggle, the subjugation of all the ruling chiefs in the different islands. When he died, in 1819, at the age of sixty-six, he was king of the whole group. To him succeeded LIHO-LIHO, his son, in whose reign the first missionaries arrived in Owhyhee, sent out by a society from the United States ; this was in 1820, and in 1823 LIHO-LIHO (with the consent of a council of chiefs) proposed to visit England ; in November he embarked on board the *Aigle* with his wife, prime minister, and attendants,—and arrived in this country in the following May. Unfortunately LIHO-LIHO and his wife died in London ; whereupon the English government appointed the *Blonde* frigate, under the command of Lord BYRON, to convey the rest of the party, together with the remains of their king and queen, back to the Sandwich islands,—a circumstance which had the happiest effect on the islanders.

LIHO-LIHO on succeeding to the sovereignty of the islands had taken the title of KAMEHAMEHA II.: on his death his brother, then twelve years old, was proclaimed king as KAMEHAMEHA III., under the regency of his mother; but on the death of the latter in 1833, the young king assumed the entire government of the islands. Meanwhile Honolulu in Waahoo had become the capital of the new kingdom.

As before observed, it is unnecessary to give any account of the natives as they were found by the early voyagers; their habits, manners, customs, and religious rites have been fully described by COOK and VANCOUVER, and from time to time by various missionaries;—these, however, since the consolidation of the islands under one government, have been wholly changed, and now they assimilate more to the European character; civilization has made considerable progress among all classes, and in lieu of their old idolatrous rites and superstitions the entire population has embraced Christianity. In 1840 the political affairs of the islands were arranged by a declaration of rights and a form of constitution; in 1843 the independence of the group, as the Hawaiian kingdom, was acknowledged by Great Britain, France, and the United States; and on several occasions since that date treaties of peace, friendship, and commerce have been exchanged with the principal European nations.

The present sovereign is KAMEHAMEHA V., who has given his subjects a new constitution—one better adapted to their present civilization and national ideas; under this constitution they have a chamber of nobles and a chamber of representatives, whose duties are to make the laws and to vote supplies.

Newspapers in both the English and native (Kanaka) languages are published at Honolulu, where there is also a good library. Churches, chapels, and schools are to be found in every island; and the Church of England is presided over by a bishop.

**Physical Character and Aspect of the Islands.**—Every island of the Hawaiian archipelago is essentially volcanic, and mainly, if not entirely, due to the effect of successive eruptions from craters that have been more or less active through long periods of time,—while the line of force appears to have been directed from W.N.W. to E.S.E. It may also well be that the group was based on an area of elevation—of gradual upheaval,—and indeed it is said that indications are not wanting that this process is still silently and almost imperceptibly extending the coast-lines;—the fact of there being at times local subsidences does not militate against this view, for these are of the very nature of volcanic and earthquake phenomena—occasional local subsidence with general elevation, or *vice versa*.

Whether at any period of their physical history, in bygone days, any of the islands could have been classed as belonging to the “atolls” and “fringing reefs,” so common over a large area of the Pacific, is unknown; for in a geological point of view they have not been very critically examined; in the island of Molokai, however, well-defined coral is found at the height of 500 feet above the sea; a bed of coral or coral sand also exists at an elevation of 4000 feet in Kauai; and coral has been reported to be here and there interstratified with lava beds in some of the other islands, notably in Maui and Oahu, but to what extent has never been ascertained.

The earthquakes experienced in these islands are rarely severe or destructive—usually only very slight tremors and vibrations; the heaviest are confined to the districts south of the parallel of Mauna Kea. The great sea-wave—the usual concomitant of earthquakes originating near the sea-coast, or under the bed of the

ocean—has often been very destructive here, sweeping away villages bordering the shore, and consequently resulting in great loss of life and property;—in fact, the sea-wave wherever it occurs is often more disastrous than the earth-wave.

Kauai, Niihau, and the contiguous islets are often stated to be the oldest islands of the archipelago, but the evidence is not conclusive on this point. In Kauai, the volcanic mounds and craters are generally rounded off into gently undulating hills; the scenery is soft and beautiful, and the whole island a perfect garden in appearance, and most fertile; the craters and *palis* are no doubt of great antiquity; and the valley of Hanapepe, evidently formed by volcanic action—with its basaltic rocks generally greatly contorted and their columnar structure very distinct—has now a fine rivulet with a beautiful waterfall in it;—but if the igneous rocks in the different islands are alike in character these facts tend rather to show that volcanic energy has been longer dormant in Kauai than that it is the oldest member of the group.

Of the *extinct craters*, two in Oahu—viz., Punch Bowl hill, on the edge of which is a fort, and Diamond hill, a very conspicuous headland with a deep cavity—are well known from being situated near Honolulu, the chief sea-port and the capital of the Hawaiian kingdom; but the most remarkable and largest known crater in the world is that of *Mauna Hale-a-ka-la*, or the “House of the Sun,” in East Maui, 10,200 feet above the level of the sea, over 12 miles in the linear measure of its rim, and 2 miles wide in its broadest part; it is destitute of trees to the height of about 2000 feet; then succeeds a belt of forest to the height of 6000 feet; and again, the summit, which is cleft by a deep gorge, is bare. At the height of 8000 feet there is a large cave which affords shelter should the weather be unpropitious during the ascent.

“There are some sandalwood bushes about 500 feet above the cave, and the ground assumes a more stony appearance; the rock became now and then more visible, which had not before been the case. Where the rock was exposed it was found to be lava more or less vesicular, but no regular stream was observed. The surface of the lava appeared to be more thickly covered with earth than that of Mauna Kea, and consequently a greater proportion of soil existed, as well as a thick coating of gravel. Near the summit bullock-tracks were observed, and likewise those of wild dogs, but no other animals were seen except a few goats.

“The crater of Haleakala, if so it may be called, is a deep gorge, open at the north and east, forming a kind of elbow: the bottom of it, as ascertained by the barometer, was 2783 feet below the summit peak, and 2093 feet below the wall. Although its sides are steep, yet a descent is practicable at almost any part of it. The inside of the crater was entirely bare of vegetation, and from its bottom arose some large hills of scoria and sand: some of the latter are of an ochre-red colour at the summit, with small craters in the centre. All bore the appearance of volcanic action, but the natives have no tradition of an eruption. It was said, however, that in former times the dread goddess Pele had her habitation here, but was driven out by the sea, and then took up her abode on Hawaii, where she has ever since remained. Can this legend refer to a time when the volcanoes of Maui were in activity?

“The gravel that occurred on the top was composed of small angular pieces of cellular lava, resembling comminuted mineral coal. The rock was of the same character as that seen below, containing irregular cavities rather than vesicles. Some-

times grains of chrysolite and hornblende were disseminated. In some spots the rock was observed to be compact, and had the appearance of argillite or slate: this variety occurred here chiefly in blocks, but was also seen *in situ*. It affords the whetstones of the natives, and marks were seen which they had left in procuring them." (WILKES.)

The fires that have been dormant for ages in the N.W., and for centuries in the central group of islands, are ever burning in the S.E.; and in Hawaii, the largest and southernmost of the archipelago, are to be found the most remarkable volcanoes on the earth,—the largest and deepest of craters, if not the loftiest,—and in which the communication between the interior and exterior of the globe is unceasingly active, and may be studied to greater advantage than in any other place. In the north of the island are the heights of Kohala, 9800 feet above the sea level, behind which is the grassy and fertile table-land of Waimea; to the eastward of both rises the snow-clad summit of **Mauna Kea**, 13,953 feet above the sea, which has never been active within the period of the traditions of the people; in fact, a line passing through Mauna Kea from west to east would nearly define the parts to the north and south of it, *now* respectively exempt from, and exposed to flows of lava, and even to destructive earthquakes.

Running parallel with the west coast of Hawaii is a mountain range, near the north extremity of which is Hualalai, at an elevation of about 7830 feet above the sea. The last eruption of this volcano took place in 1801;—on that occasion the stream of lava flowed in a westerly direction, and extended the coast-line by filling up a large bay, and forming a headland running 3 or 4 miles seaward.

**Mauna Loa**—the "great mountain"—13,760 feet above the level of the sea, lies S.E. from Hualalai, and S.S.W. from Mauna Kea, in lat.  $19^{\circ} 28' 19''$  N., long.  $155^{\circ} 37'$  W.: at its summit is the huge crater of Moku-a-weo-weo, varying from 470 to 784 feet in depth, and having a total circuit on its outer rim of not less than 9 miles.

"Nothing can exceed the devastation of the mountain: the whole area of it is one mass of lava, that has at one time been thrown out in a fluid state from its terminal crater. There is no sand or other rock; nothing but lava, on whichever side the eye is turned. To appearance it is of different ages, some of very ancient date, though as yet not decomposed, and the alternations of heat and cold, with rain and snow, seem to have united in vain for its destruction. In some places it is quite smooth, being what the natives describe as the *pahoehoi*, or 'satin stream;' again, it appears in the form of clinkers, which are seldom found in heaps, but lie extended in beds for miles in length, sometimes a mile wide, and occasionally raised from 10 to 20 feet above the surface of the surrounding lava.

"The place where these clinkers appear to me to have been formed is in the crater itself; there they have been broken up by contending forces, and afterwards ejected with the more fluid lava, and borne upon its surface down the mountain side, until they became arrested in their course by the accumulating weight, or stopped by the excessive friction that the mass had to overcome. In this way the beds, or rather streams, of them might have been formed, which would accumulate for miles, and continue to increase as the crater discharged this description of scoria." (WILKES.)

But all active volcanic craters are insignificant by the side of **Kilauea**; it is connected with Mauna Loa, and situated on its east side; it was visited by WILKES,

U.S. Exploring Expedition, and, being then in a state of comparative quiescence, is thus spoken of by him :—

“Just as we reached the great plain of the volcano, we approached the southern limit of the wood, and, on turning its corner, Mauna Loa burst upon us in all its grandeur. The day was extremely fine, the atmosphere pure and clear, except a few flying clouds, and this immense dome rose before us from a plain some 20 miles in breadth. I had not, until then, formed any adequate idea of its magnitude and height. The whole dome appeared of a bronze colour, and its uninterrupted smooth outline was relieved against the deep blue of a tropical sky. Masses of clouds were floating around it, throwing their shadows distinctly on its sides, to which they gave occasional relief and variety. There was a bluish haze resting on the plain, that apparently gave it great distance, though this was partially counteracted by the distinctiveness of the dome. I now, for the first time, felt the magnitude of the task I had undertaken.

“So striking was the mountain, that I was surprised and disappointed when called upon by my friend to look at the volcano of Kilauea; for I saw nothing before us but a huge pit, black, ill-looking, and totally different from what I had anticipated. There were no jets of fire, no eruptions of heated stones, no cones, nothing but a depression, that, in the midst of the vast plain by which it is surrounded, appeared small and insignificant.

“We hurried to the edge of the cavity, in order to get a view of its interior, and as we approached, vapour issuing from numerous cracks showed that we were passing over ground beneath which fire was raging. The rushing of the wind past us was as if it were drawn inwards to support the combustion of some mighty conflagration.

“When the edge is reached, the extent of the cavity becomes apparent, and its depth became sensible by comparison with the figures of some of our party who had already descended. The vastness thus made sensible transfixes the mind with astonishment, and every instant the impression of grandeur and magnitude increases. To give an idea of its capacity, the city of New York might be placed within it, and when at its bottom would be hardly noticed, for it is  $3\frac{1}{2}$  miles long,  $2\frac{1}{2}$  wide, and over 1000 feet deep. A black ledge surrounds it at the depth of 660 feet, and thence to the bottom is 384 feet. The bottom looks, in the daytime, like a heap of smouldering ruins. The descent to the ledge appears to the sight a short and easy task, but it takes an hour to accomplish.

“We pitched our tents in full view of the volcano, and sat on its northern bank for a long time in silence. We succeeded in reaching the second ledge, though the way to it is steep, rugged, and uncertain. At the edge of the pool, or lake of fire, the light was so strong that it enabled me to read the smallest print. This pool is 1500 feet long by 1000 wide, and of an oval figure.

“I was struck with the absence of any noise, except a low murmuring, like that which is heard from the boiling of a thick liquid. The lake was apparently rising, and wanted but a few feet of overflowing its banks. When I began to reflect upon the position we were in, its insecurity, and the vast and deep fires beneath, with the high basaltic walls encompassing us on all sides, I found it difficult to comprehend how such a reservoir can thus be pent up, and be viewed in such close proximity,

without accident or danger. The whole party was perfectly silent, and the countenance of each individual expressed the feeling of awe and wonder which I felt in so great a degree myself, and which the scene was so well calculated to excite.

"No one can see all this and yet doubt the theory of the igneous fluidity of the centre of the earth. All combustible causes that we are acquainted with are totally inadequate to produce such an effect. The whole seemed boiling up like a fountain, differing only in density and colour.

"The crater, at night, was extremely beautiful, and we sat for a long time watching its changing and glowing pool. The shadows thrown by the walls of the crater seemed to reach the heavens, and gave it the appearance of being clothed in a dark cloud; but on looking at it more attentively, and shutting off the glare of the crater, the stars were perceived shining brightly.

"About 4 o'clock a loud report was heard from the direction of the boiling lake, which proved to have been caused by a large projecting point of the black ledge near the lake having fallen in and disappeared."

As might be expected such a crater is constantly undergoing some change, therefore no description at one period correctly represents it at another.

**Volcanic Eruptions.**—The following is a list of the eruptions that have occurred on Mauna Loa and Kilauea since the islands were discovered by COOK:—

1.—*In 1789*, an eruption of Kilauea, in which ashes, sand, and pumice stone were showered over the country, and one-third of the army of Keona destroyed. No details are known.

2.—*In 1823*, an eruption of Kilauea; the lava reached the sea, 12 miles distant, directly below the crater.

3.—*In 1832*, an eruption both of Kilauea and of the summit crater of Mauna Loa. The lava flowed out of several vents on the side of the mountain, for two or three weeks, and is supposed to have entered Kawaihae bay.

4.—*May 30th, 1840*, an eruption took place in Puna, below and out of Kilauea, flowing into the sea at Nanawale. This stream was eighteen or twenty miles in length.

5.—*January 10th, 1843*, a lava stream from the summit of Mauna Loa, north of the old crater of Mokuaweoweo. It took a northerly course towards Mauna Kea, at the base of which the stream divided, one running for a few miles easterly towards Hilo, and the other north-westerly towards the village of Kawaihae.

6.—*February 15th, 1852*, an eruption broke out very near the source of that of 1843, perhaps a mile or two eastward of it; the stream of lava followed the same course as its predecessor, till it reached the low land, when it ceased, after continuing only twenty-four hours. Two days later it burst out some 15 miles further south-east, directly opposite Hilo, and at an elevation of 10,000 feet. It continued flowing for about one month, running a distance of 30 miles, but did not reach the sea.

7.—*On the 11th of August, 1855*, occurred the most extensive eruption on Mauna Loa that has ever been recorded. The light was first seen on the very summit, and the stream undoubtedly originated in the old summit crater of Mokuaweoweo, and taking a north-easterly direction, ran down towards Mauna Kea, after reaching which it was turned towards Hilo. For thirteen months it continued to flow, filling up ravines and valleys in its course till it came within three miles of Hilo,

when it ceased. The extent of this eruption may be judged from the fact that it has been estimated to have flooded an area of 300 square miles.

8.—*On the 23rd of January, 1859*, a great eruption took place on the north side of Mauna Loa, at an elevation of 8500 feet. From a crater about 500 feet in diameter, lava continued to flow for six months, reaching the sea 15 miles south of Kawaihae.

9.—*The last eruption, that of 1868*, began in March. After a series of earthquakes, some of which were very destructive, and accompanied by the great sea-wave and a mud eruption which swept away and buried villages, men, cattle, &c., on the 7th April, ten days after the first symptoms of the convulsion, a new crater opened on the flank of Mauna Loa; a stream of lava flowed into the sea half-way between Apua and the southern point, the mud-flow meanwhile wending its course to the north of this direction. One of the fairest parts of the island was thus in a single day converted into a black-looking, desolate tract of cinders and mud. In many places in Kau the ground has opened, chasms of unknown depth have formed, whence sulphurous exhalations are emitted: a fissure, some miles in length, has extended inland from the coast, crossing one of the island high roads, and so deflecting it that what were contrary sides before are, at the point of breakage, now in one and the same straight line. The floor of the crater in the Kilauea volcano has sunk considerably. At Lahaina, upwards of 100 miles from the starting point of the eruption, the column of cloud ascending from it was observed under an angle of  $3^{\circ} 30'$ , which (allowing for 500 feet of altitude, the position of the observer) indicated a height of nearly eight miles. So vast a body of vapour rushing visibly upwards with tremendous rapidity, proved the presence of an immense heat at its base; the great rarefaction by heat of the air near the new crater would cause a powerful upward draught; then the cold air, charged with the vapours of the surrounding sea, must rush in; for days after the eruption, the leeward islands were enveloped not only in a close oppressive atmosphere, but in clouds and heavy rains. A very distinct odour of sulphurous acid was perceptible at Honolulu 180 miles distant, two days after the eruption. The earthquakes were continued at intervals for some months; and by the last account, dated Jan. 16th, 1869, shocks of earthquakes were quite common, and the smoke was very dense on the Kau slope of Mauna Loa.

The late volcanic eruptions and geological disturbances in Hawaii appear to have been peculiar, as described by the Rev. TITUS COAN. In one place the sea lies 4 feet deep in cocoa-nut groves which were formerly at a distance from the water; in another, a beach of lava-sand has been driven in among cocoa-nut trees 200 feet; in other places, the trees are buried 8 to 10 feet in sand, and the shore line is pushed in 100 feet; and at Kalapanu, the tide now rises and falls within the walls of a church that stood 200 feet from the water. The eruption itself was short and fierce, and the lava streams rushed down so rapidly that cattle grazing in the pastures were surrounded by the fiery flood before they had scented danger: some were scorched to death; but here and there small green patches were left untouched, with 10 or 20 kine still alive. Houses, with their inmates also, escaped burning, though surrounded by the molten stream as high as the roof-tree; from which it may be inferred that the lava cooled rapidly. All this was followed

on August 8th by a most awful thunderstorm, which continued from noon till midnight. The air felt like hot steam, and white streams of lightning ran flashing along the ground. Then, from the 14th to the 16th, the tidal disturbances were witnessed which communicated to all the shores of the Pacific evidence of the terrible earthquake in Peru. During those three days the sea rose and fell from 3 to 6 feet, once in 10, 15, or 20 minutes.

These eruptions are all that are known to have ejected lava streams during the last 90 years, though prior to the year 1820, eruptions may have occurred of which no record exists. The summit crater of Mauna Loa has often been temporarily lighted up or covered with dense smoke, which has passed away without being followed by lava streams.

**Population, &c.**—At the period of the discovery of these islands by Cook, in 1778, he estimated the population at 400,000, but probably it was less, and it is generally supposed, from whatever cause, to have been even then numerically on the wane. Statistics show that it is still decreasing; in 1823 it was estimated at 142,100; and by the official census of 1853 it had fallen to 73,134,—a decrease of 68,966, or nearly one-half in 20 years, but within this period had occurred the “year of death” (1848), when not less than 10,000 persons were swept off by measles, hooping-cough, and influenza. By the census of 1860 the natives numbered only 67,084, whilst the foreigners amounted to 2716; but the last census, taken in 1867, shows a further decrease of the native population of 8319 in seven years, while the number of foreigners had considerably increased,—the totals being 58,765 natives and 4194 foreigners. It is, however, computed that the number of natives now annually afloat on foreign voyages is not less than from 2000 to 4000, many of whom never return. Strange that the introduction of civilization among, and the acquisition of new habits by a people should tend towards their final extinction!—much of this depopulation was, however, undoubtedly accelerated by the licentiousness of our own race.

The natives are strong, active, well-made, and rather above the average height of Europeans. The skin of those much exposed to the sun is of a dark olive brown, but the complexion of the nobles is comparatively fair. The face is wide, the eyes are bright and black, and the nose though not flat is characterized by a fulness of the nostrils. The hair is black and wavy, but with no approach to woolliness. The women are generally good-looking if not handsome, and unquestionably attractive. The chiefs, male and female, frequently attain to great corpulency in their advancing years.

Courage was always a marked feature in the Hawaiians; but since the termination of the internecine wars among the chiefs of the different islands, this quality has only displayed itself in the exercise of athletic and daring sports. The men make excellent sailors, and are employed in large numbers in all vessels frequenting the Pacific Ocean.

In character they are cheerful and generous; noted for courtesy and hospitality; but rather indolent than active.

Though human sacrifices were offered to their gods in days of old, the Hawaiians were never addicted to cannibalism.

**Produce and Supplies**—**ANIMAL AND VEGETABLE** :—Both for exportation and

for ships' use these are to be obtained in great varieties; all the usual tropical fruits and roots are indigenous, while a vast number of animals and plants introduced since the days of Cook have thriven and are now abundant.

Cattle and sheep are plentiful upon all the large islands,—the former roaming wild through the forests of Hawaii, and of these many are annually destroyed merely for the sake of the hide. Burdens which were once borne upon the shoulders of men are now consigned to the backs of horses, mules, and asses,—indeed it has been said there is “a plague of horses,” especially in Oahu, where everybody rides. Hogs and goats, both tame and wild, are abundant; and the wild hog is hunted in some localities. Dogs are also wild in Hawaii and Kauai; they roam in large packs and are very destructive in the cattle ranches and sheep farms. The domestic fowl, turkey, goose, duck, pigeon, snipe, plover, &c., most of them originally importations, have rapidly multiplied and are to be procured in any quantity.

Sugar and molasses, coffee, rice, tapioca, wheat, maize, beans, peas, yams, taro (*arum esculentum*), potatoes, oranges, limes, grapes, pine-apples, pumpkins, bread-fruit, plantains, and many other fruits and vegetables flourish; and what are not exported or used by the native population are in constant demand for vessels frequenting or calling at the various ports.

Cotton is an article of export, and the silkworm has been introduced with every prospect of success. The natives manufacture some light cloths; their grass bags are good and substantial; and their mats strong, and many of them remarkable for their beauty.

All the best sandal-wood has been cut down and sold in the China market; what remains is very young, but there are many other fine and useful forest trees.

A large extent of land in the different islands of the group still awaits the application of capital, skill, and labour to develop its resources; there was until lately a great deficiency of hands, added to which, the natives are not as industrious as they might be; consequently Chinese and Japanese coolies and labourers have been recently imported with advantage.

**Winds and Climate.**—The N.E. Trade-wind, generally blowing strong, prevails for eight or nine months in the year, depositing the vapours of the ocean on the northern and eastern slopes of the islands in gentle fertilizing showers; but during this period, for many miles to leeward of the larger islands, frequent calms and light baffling airs impede navigation between the various ports. The rainy season usually commences in January or February and ends in the middle of April or beginning of May, and the rainfall at times is heavy; during this period the usual Trade-winds are interrupted by gales from N.W. to S.W. The windward sides of the islands are generally colder and more subject to rain than those to leeward; they are also liable to fogs in the spring of the year, while those which are opposite are enjoying sunshine.

The greatest heat occurs in July, and the greatest cold in January. Near the sea the thermometer never rises above 86° Fahr., whilst its lowest reading is rarely less than 60°. Honolulu is under the isothermal line of 77°, and the annual range of the thermometer is only 12°. But nowhere with the same extent of coast-line and surface are the local climates so various; by ascending the higher lands you may live in any temperature between that of the tropics and the frigid zone; thus, on the table-land of Waimea in Hawaii a fire is very comfortable,—for there the average

reading is  $64^{\circ}$ , with a maximum range of  $32^{\circ}$ . The climate is very healthy to Europeans, and on the whole most favourable to vegetation,—while the soil, volcanic in its origin, is generally fertile.

Waterspouts not unfrequently visit the islands and neighbouring seas.

**Tides.**—It is high water at F. and C. at about  $3\frac{1}{2}$  h. to 4 h.; and the rise and fall varies from  $1\frac{1}{2}$  feet at neaps to 2 feet at springs. The tides are, however, much influenced by the winds in some of the ports, consequently at times they rise higher and fall lower than here indicated.

**Currents.**—The general tendency of the set in the vicinity of the Hawaiian islands is towards the west; but it must be remembered that the archipelago is near the northern limit of the North Equatorial current, consequently, it is subject to much variation both in force and direction at different seasons, and is especially influenced by the prevalent direction of the wind. On the shores of the northern islands, drift wood comes from the N.W. coast of America, and it is probable that on more than one occasion Japanese junks have found their way hither; it is scarcely to be supposed that they were carried direct, but rather as a consequence of that general circulation of the waters of the North Pacific to which reference is made on p. 89 of "Notes on the Winds and Currents of the Pacific Ocean."

**Pilots.**—On the proper signal being made pilots are always ready in every port; they are frequently English or American masters retired from the sea, and consequently know how to handle a ship. Most of the ports are quite accessible without such assistance, others are not; but indeed it would always be better for a stranger to take one.

**HAWAII.**—This island—the OWHYHEE of COOK—the south-easternmost and largest of the group, lies between lat.  $18^{\circ}52'$  and  $20^{\circ}17'$  N., and between long.  $154^{\circ}42'$  and  $156^{\circ}5'$  W.; it is 85 miles long (N. by W. and S. by E.), and 78 miles wide (east and west), having an area of about 4000 square miles, and a population in 1866 of 19,798 persons. It is divided into several districts; those along the coast are,—Kau and Puna on the south and S.E., Hilo and Hamakua on the N.E., Kohala on the N.W., and Kona on the west; but physically it consists of the three mountains—Mauna Kea, Mauna Loa, and Mauna Hualalai, of the elevated plain between the mountains, and of the more or less gentle slopes from their bases to the sea.

On the windward side, owing to the abundant rains, vegetation is luxuriant; here is situated the fine harbour (the only one on that side) and the pleasant town of Hilo, in the vicinity of which are several sugar plantations. The coffee shrub attains a large growth and bears well on the N.E. side of the island, but the quality is not considered equal to that raised on the leeward side. From Hilo round to Kohala, facing the N.E. Trade-winds, the land near the sea is composed of precipitous bluffs, broken frequently by enormous gulches or ravines through which the mountain streams from the side of Mauna Kea fall into the ocean; though bleak from its constant exposure to the strong Trades, this portion of Hawaii is rich in agricultural resources, and as a grazing country is unsurpassed.

On the sides of Mauna Kea, at an elevation of from 6000 to 10,000 feet above the

sea, roam large herds of wild cattle—the descendants of VANCOUVER's gift to KAMEHAMEHA I.; during the ten years' *taboo* for which VANCOUVER had stipulated the animals multiplied to such an extent that numbers of them were turned loose on the mountain, and they have since been largely recruited by runaways from the tame herds of Waimea.

Waimea is a plateau, about 20 miles wide, on the southern side of the Kohala mountains, and approaching the highlands of Mauna Kea; it was formerly covered with a forest of *kukui* and *ohia*, but the rapid increase of cattle there within the last thirty years has resulted in the utter destruction of the forest, and a consequent change of climate. Old residents speak of the climate of Waimea as having been moist and salubrious, whereas at present it is dry, but little rain falling the year round; exposed to the full force of the Trade-wind, which at that elevation (about 4000 feet) is quite chilling, easterly blasts, after rushing through the breaks and passes of the mountains, sweep at intervals over the elevated plain, sometimes with the violence of the winds of winter in high northern latitudes. Both cattle and sheep are bred by the mountaineers in considerable numbers.

The district of Kona, on the west or leeward side of Hawaii, is formed by the west slope of Mauna Hualalai and the mountain range running thence to the southward; a large portion of its surface is rocky and unfit for cultivation. Seen from seaward it has a very desolate appearance; in fact, from Kawaihae to Kealahou, and thence round to the district of Kau, on the south the tract of country along the coast varying in width from half a mile to two miles seems to be little else than black lava—the débris of extinct volcanic action. But from Kailua to Kealahou, at an elevation of from 500 to 2000 feet, the soil among the decomposing lava is inexhaustibly rich; here the best coffee is cultivated, and the finest oranges, pineapples, grapes, &c., are grown; indeed it is generally conceded to be the best fruit district on the islands, every variety attaining a perfection rarely found in other Hawaiian localities. The common castor-oil plant is frequently seen here with a trunk five or six inches in diameter, and spreading out like a tree, the lower branches several feet from the ground.

That portion of the south end of the island which forms the district of Kau is, in most parts, like the Kona side, composed of barren rocks from the sea to several miles inland, where the arable land commences; this spreads out into a broad plain, gradually ascending to the mountains, admirably fitted for pasturage. The cultivation of wheat has been introduced in the more elevated parts of Kau, and has been found to succeed well.

The Puna district is very fertile and the hill-sides covered with a fine verdure. The N.E. end is low and flat; the acclivity of the inland parts is very gradual, and the whole country covered with cocoa-nut and bread-fruit trees. That part of the district facing the S.E. rises somewhat abruptly from the shore, leaving but a narrow border of low ground towards the beach.

**The South point (Ka Lae) of Hawaii** is in about lat.  $18^{\circ} 52\frac{1}{2}'$  N., long.  $155^{\circ} 38'$  W., and near it is a small village; thence to Peli point, 19 miles in a W. by N.  $\frac{1}{2}$  N. direction, and to Kapoho point, 65 miles in a N.E.-ly direction, there is neither shelter nor anchorage of any description,—the shore in many parts being *nearly straight* and exposed to a tremendous surf, such as to render landing highly



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dangerous, if not impossible. Here and there along the shore and on the hill-sides, may be seen small villages and dwellings of various kinds; and in a bend of the S.E. coast to the westward of Apua point, is the spot where the lava from Kilauea volcano has frequently come down to the sea.

**Kapeho point**, near which are two villages, is the most easterly extremity of Hawaii; it is in about lat.  $19^{\circ} 31\frac{1}{2}'$  N., long.  $154^{\circ} 43'$  W., and should not be approached too closely, as it is uncertain whether or no there are some rocks and a small reef off it. Thence the coast trends in a N.W.-ly direction for the distance of 21 miles to cape Lelewi, round which is Hilo bay.

**Hilo or Byron Bay.**—This bay was unknown to COOK. Two attempts were made by VANCOUVER to enter it, but he was deterred by the weather from bringing up; he calls it Whyeatea, and describes it as a tolerably secure and convenient place during the prevalence of southerly winds; "the land formed a deep bay which was additionally sheltered by a reef lying off its S.E. point, with soundings from 25 to 6 fathoms, clear sandy bottom; it was entirely exposed to the northerly winds, which (then) blew very strong; and being attended with a heavy sea from that quarter, rendered any attempt to land from our boats impracticable." H.M.S. *Blonde* (in 1825) was the first man-of-war that entered here, and it was called BYRON bay after the commander; it was also visited by the U.S. squadron in 1840, and is now a frequent place of resort to vessels trading in the Pacific.

Hilo in Hawaiian means "like a new moon," and describes at once the shape of the bay; Waiakea is the village on the east side, but custom includes all under the former name. The town is straggling and rendered almost invisible by the luxuriant growth of the sugar-cane which the natives plant around their houses; there are also missionary stations (Protestant and Roman Catholic), a few European stores and other buildings, and an indifferent wharf. Waiakea point is on the opposite side of the bay from Hilo, the distance between them being a little more than a mile, and the path leads along a sandy beach on which the surf continually breaks, and at times with great violence. The scene which the island presents as viewed from the anchorage in the bay is both novel and splendid; the shores are studded with extensive groves of cocoa-nut and bread-fruit trees, interspersed with plantations of sugar-cane; through these numerous streams are seen hurrying to the ocean: the low, thatched huts of the natives, with occasionally a more pretentious house, are seen nestling close within the hill-sides; to these succeeds a belt of some miles in width, free from wood, but clothed in verdure; beyond is a wider belt of forest, whose trees, as they rise higher and higher from the sea, change their characters from the vegetation of the tropics to that of the temperate and polar regions; and above all tower Mauna Loa, in front (sometimes with banks of snow along its crest), and Mauna Kea on the right, looking down upon one of the greenest landscapes that ever rose from the sea-shore. There are several extinct volcanic cones in the immediate vicinity of the town.

Hilo is the second town as regards commercial importance in the Hawaiian islands. Some think it may ultimately take precedence of Honolulu. It contains little less than 2000 inhabitants. Of these 75 are American. Equal in number to the Americans—if not greater—the Chinese constitute a very important portion of

the population ; they are generally of a superior class, mostly merchants and men of business,—active and energetic. The first Chinese emigrants married with the natives, hence there is a large proportion of mixed blood, descendants of Hawaiians and Celestials ; they are handsome, quick, and intelligent, and are particularly remarkable for their aptitude in speaking English. Of the Europeans, there are three English, three Germans, and three Spaniards. There are eight (1868) retail commercial houses with a large supply of dry goods, groceries, and ship chandlery, an iron foundry, two small mills, a turner's, a lumber yard, a picture gallery, blacksmith's and shoemaker's shops, a bakery, a butcher's (where splendid beef is supplied), and rarely a liquor shop or barber's pole ; there is one physician, with an ample drug store, but no licensed lawyers—only aspirants to that honour. In Hilo there is no ancient temple, nor any similar work of the old natives, such as may be seen in some parts of the islands ; the fishpond at Waiakea, full of fine mullet, is the only relic of the past.

**THE BAY AND ITS SHORES.**—The entrance to Hilo bay is between cape Leleiwi (in about lat.  $19^{\circ} 47' N.$ , long.  $154^{\circ} 57' W.$ ) and Laphahoi bay—a small indentation on the coast where some streams descending from the flanks of the mountains discharge their waters, and near to which are several scattered huts. The west side of Hilo bay runs nearly N. by W. and S. by E. ; on this side, at the distance of  $1\frac{1}{2}$  miles southward from Laphahoi bay is a conspicuous projecting point called *Red cliff*;  $1\frac{3}{4}$  miles still further southward is a deep but narrow inlet called *Cocoa-nut cove*, in consequence of there being a group of cocoa-nut trees at its entrance ; the next remarkable object to the southward is *Turret rock* (15 feet high), standing off a point  $1\frac{1}{2}$  miles from the opening to Cocoa-nut cove. About  $\frac{1}{2}$  a mile beyond Turret rock, in the S.W. corner of Hilo bay, is *Waterfall creek*, formed by the mouth of the Waialuku river and its affluents ; the river is barred and the projecting point on the east side of the creek has several rocky heads in its vicinity. On the east side of the bottom of the bay, and bearing about East (true) from the entrance to Waterfall creek, is *Cocoa-nut island*, in lat.  $19^{\circ} 43' 51'' N.$ , long.  $155^{\circ} 4' W.$  ; on the shores of the bight between the creek and island stand the town and plantations.

To the S.S.W. of Waterfall creek is *Green hill*, a very conspicuous extinct volcano, which forms a leading mark for the anchorage.

**Blonde reef.**—A reef commencing near Turret rock fronts the shore to the distance of  $\frac{1}{2}$  of a mile in some places, and passing to the northward and eastward of Cocoa-nut island, then bends abruptly to the W.N.W.-ward, and stretching more than half way across the bay is known as Blonde reef ; it is dangerous and has several off-lying shoal spots.

The **ANCHORAGE** is round Blonde reef in 6 to 8 fathoms ; the west side of the reef must not be approached too closely on entering ; there is a clear *channel*  $\frac{1}{4}$  of a mile wide between the western edge of the reef and the west shore of the bay, in which are 10 to 11 fathoms.

The harbour of Hilo, with little expense, could be made one of the safest and most commodious in the Pacific : by constructing a breakwater on the reef, northward from the point beyond Waiakea, it would be perfectly landlocked and sheltered at all times ; immense beds of basaltic, vitreous, and vesicular lava lie within a short dis-

tance;—a tramway constructed thence towards the reef, and the utilization of the convict labour of the island, would accomplish the work in a few years.

There is a good *watering place* up Waterfall creek, within the mouth of the Waiafuku river, which is generally easy of access, except when the wind is blowing hard from the N.E.-ward; on such occasions the surf is high, and the rocky bar at the entrance then becomes dangerous for boats to pass. The water is excellent and abundant.

The best *landing place* is southward of Cocoa-nut island, in the S.E. corner of the bay, but it is feasible to land on the beach in proper boats.

PROVISIONS of all kinds—animal and vegetable—may be procured in abundance and at cheap rates. Wood is more abundant and costs less than at Honolulu.

TIDE.—The rise of the tide is 3 feet; high water at F. and C. at 1 h.

CLIMATE.—A great drawback to this port is the quantity of rain that falls,—and the rainy season lasts here longer than in other parts; in fact it may rain at any time of the year, but the showers out of the rainy season are not heavy nor of long duration.

SAILING DIRECTIONS;—The following are by Lieut. MALDEN, of H.M.S. *Blonde*, who surveyed the bay in 1825:—*Steering for the anchorage*, with the sea-breeze, when about 3 miles from the bottom of the bay you will be outside the reef, in 25 to 30 fathoms. The west shore must then be kept close on board. The leading marks for the channel, to clear the west end of Blonde reef, are,—keep the huts on the west side of Waterfall creek on with the *eastern* side of a remarkable green hill (an extinct volcano), impossible to be mistaken, bearing by compass S.S.W.  $\frac{1}{4}$  W., till the Turret rock bears W. by S.  $\frac{1}{4}$  S., when you will be in 7 or 8 fathoms, stiff muddy bottom. When upon the west extremity of Blonde reef, the above huts are in one with the *western* side of the green hill, bearing by compass S.  $29^{\circ}$  W.; and at the same time the centre of the same hill is on with the left of two very distant hummocks,—the latter, however, are frequently obscured by haze, or they would be the best marks. When at the north extreme of the reef Cocoa-nut cove is quite open, bearing W. by N. As there are no dangers in the channel, and it is more than  $\frac{1}{2}$  of a mile wide, there is quite room to *beat any vessel out* against the sea-breeze, and which, if it be fresh and steady, is preferable to running out at daylight with the land wind. The land wind frequently leaves you in the lurch, and you are obliged to come to in deep water, to prevent being driven upon the rocky cliffs of the west coast. Indeed, in turning out of the bay, with a good strong sea-breeze, as soon as you are to windward of the reef, you should keep beating to windward in a N.E. or N.E. by E. direction, not attempting to weather the north point of the bay until it can be done with certainty, at the distance of 5 or 6 miles at least; for, when at 3 or 4 miles to the northward of Cocoa-nut cove there is no bottom with 50 fathoms, although within  $\frac{1}{2}$  a mile off shore; so that, should a vessel in this situation be becalmed, her state would be most dangerous, a heavy swell and current constantly setting against the precipitous cliffs. (Lieut. MALDEN.)

WILKES (1841) remarks—that in sailing towards Hilo bay, Hawaii has but few of the characters that indicate a volcanic origin. To one unacquainted with the great height of the mountains, this island might appear of comparatively small elevation, for its surface rises gradually from the sea, uniform and unbroken; no abrupt spurs

or angular peaks are to be seen, and the whole is apparently clothed with a luxuriant vegetation. "Hilo bay is indifferently protected from the sea, and is almost an open roadstead, still I cannot but view it as a safe anchorage. It has an extensive sunken coral reef to seaward, which is too shoal to allow of the passage of vessels over it, and affords some protection against the rolling sea; a vessel therefore usually lies quiet, unless it is blowing strong outside; we were detained here about three months, and never had a gale strong enough to ride our anchors, though these were the winter months,—December, January, and February: at times, however, there was a considerable swell rolling in, so as to make it uncomfortable on board ship. There is no danger in entering the bay; all that is required is to avoid the west point of the reef, and on passing it to haul to the southward. We found the best anchorage on the east side of the bay, where Cocoa-nut island and the most Eastern point are in range. . . . On the 4th of March, at 9 P.M., an attempt was made to get under way, but the land-breeze failed. We made another attempt the next morning, but were again obliged to anchor near the end of the reef. I mention these circumstances in order to show the difficulties that sometimes occur in getting to sea from this port. This is in consequence of the land-breeze frequently failing near the shore, so that a vessel is sometimes becalmed for more than half a day between the two winds. Fortunately there is little or no current here, and therefore no danger to be apprehended, although it is a disagreeable situation in which to be placed."

H.M.S. *Talbot* visited this port in June, 1845, and the following extract is from the remarks of the master, Mr. H. THOMPSON:—

"After a passage of eight days (from Honolulu) we arrived off Byron bay, where we took on board a pilot, about 8 miles off shore. The sea breeze gradually fell light as we entered within the limits of the bay, and continued to blow (but very feebly) just sufficient to give the ship steerage way; but the swell assisted the vessel in, when we anchored in 5 fathoms water, and afterwards moored with 70 fathoms on best bower to N.E., and 40 fathoms on small bower to S.W., with the following bearings, viz. Cocoa-nut point E. by N.  $\frac{1}{4}$  N., the thatched native chapel on with the north side of Green hill S.W., and Red Cliff point N.  $\frac{1}{4}$  W.

"The anchorage in Byron bay is open to all winds from North to E. by N., being only sheltered in that direction by an extensive sunken reef (Blonde reef), on which the depth of water varies from 9 feet to 6 fathoms, and which sufficiently breaks the sea to render a ship comparatively safe behind it. The pilot told me that during his residence (20 years) here he had seen some very strong gales from the N.E., but had never known any vessel suffer by them; yet I am of opinion that on such occasions a vessel would find it very heavy riding, and should be provided with good ground tackle.

"A ship of any size may anchor here in from 4 to 9 fathoms water.

"There is seldom any difficulty experienced in entering this bay, as the sea-breeze blows right in, and should it be ever so light, with the assistance of the swell astern, and boats towing if necessary, the anchorage will be gained in safety. But the egress is not so easy, it is often attended with difficulty, and sometimes with risk: the channel between the reef and the shore is narrow, rather too much so to allow a square-rigged vessel to work through, unless she be a small one, and then it should be only with a commanding breeze.

"To *sail out* of Byron bay a vessel should start with the first of the land breeze, which generally comes off soon after midnight, so as to get a good offing before it ceases, otherwise if daylight is waited for, the land wind will seldom hold long enough to take a vessel sufficiently off shore to leave her in a safe position; and should the sea-breeze fail to blow home to the coast during the day, which not unfrequently happens, thereby leaving her exposed, helpless, to a heavy swell setting directly towards the reef, a vessel's own boats' towing would have but little effect against it. There is a deep water anchorage outside the reef, and there is also anchorage in the channel in 10 to 12 fathoms, but both these anchorages are unsafe when blowing fresh.

"The similarity of the coast and the want of remarkable objects in the vicinity of this bay prevents me from describing any conspicuous marks that would guide a vessel to or from the anchorage. The general rule for approaching the anchorage is to close the land a little to the northward, and run down along shore rather within the distance of half a mile, which will lead a vessel a little inside the north extremity of the reef which forms the channel; this reef may be seen from a slight elevation above the deck. There is a long gulley running up the land in a southerly direction from Cocos-nut cove, which forms a good object to steer for when once made out, as it leads close to the entrance of the channel; it appears like a dark mark in the land, and there is nothing in that vicinity that resembles it."

**The N.E. coast of Hawaii** between Hilo bay and Upolu point is generally bold, consisting of high and abrupt cliffs, the continuity of which is broken at frequent intervals by deep narrow glens or chasms; down the cliffs fall many beautiful cascades,—the streams generally finding their way to the ocean through the glens, within which are also situated the native villages; these are most numerous towards the northern end of the island. Cook's ships cruized off here for almost a month; there was frequently a very heavy sea, and great swell, on this side of the island, and having no soundings and observing much foul ground off the shore, they rarely approached nearer the land than 2 or 3 leagues.

VANCOUVER (Feb. 1793) sailed along the N.E. side of Hawaii within 2 or 3 miles of the shore; he described it as "firm and compact, terminating mostly in steep rocky cliffs, with a few small indented bays, rendered easily accessible to the canoes by the sandy beaches that bounded them; from the rugged rocky cliffs many streams of water fell and discharged themselves into the ocean." . . . The coast on the northern side of the island "is composed of a cluster of remarkably high, steep, rugged and romantic cliffs, discharging from their naked summits many rapid cataracts into the ocean: the rushing of these impetuous torrents down the black barren surface of the rocky cliffs, contrasted with the enchanting cultivated and populous country to the east and west, and behind this dreary frontier, for a considerable distance up the sides of the lofty mountains, on approaching them in the offing, present a very beautiful and picturesque appearance. Nearly in the centre of these cliffs is a tolerably deep small bay, much resembling, in appearance and in most other respects, the bay in the island of St. Helena, but, unfortunately, seemed too much exposed to the sea and the generally prevailing winds to be an eligible situation for shipping. Off the western extremity of these cliffs lie some rocky islets, at a little distance from the land: westward from these cliffs the surf was observed to break with great violence near the shore, which was then within two miles of us; at this

moment we suddenly arrived in 7 fathoms water, the west point of the island bearing S. 70° W. at the distance of 9 miles. The Trade-wind blew a strong gale, attended by a very heavy, confused, irregular sea, probably occasioned by the violence of the wind and an uneven bottom. As this appearance extended all the way to the west end of the island, on finding ourselves in soundings of 7 fathoms we hauled a little off shore."\* . . . "The western part of the land from this situation falls in a gradual descent from the base of the mountains, and forms an extensive plain towards the water side, which seemed to be in a state of high cultivation and abounded with the habitations of the natives. We passed the west point at the distance of about a league, close on the verge of the agitated water; this I suspected to arise from a very sudden decrease in its depth, but could not ascertain the fact, as the wind blew with too much violence, and the agitation of the sea was too great to venture on a more minute examination either with the ships or with the boats; and as the adjacent shores afford no shelter for vessels, there can be no necessity for approaching within a league of them."†

The west point of which VANCOUVER here speaks is the North (or N.W.) extremity of Hawaii,—Upolu point—in about lat. 20° 17' N., long. 155° 51' W. COOK made it 7' more to the west.

Having passed this point VANCOUVER hauled in towards Kawaihæ bay, and in the evening anchored about 7 miles south of Upolu point in 41 fathoms water, brown sandy bottom, with small pieces of coral (probably at *Mipi*); but the weather being boisterous, with very heavy gusts and flurries of wind directly off the land, he drove from the bank towards morning, whereupon he weighed anchor and turned up into the bay, against a strong S.E. gale.

**Kawaihæ**,—TOE-YAH-YAH of COOK,—TOEE-HYE of MEARES,—TOEAIGH of VANCOUVER;—This small port is frequently visited by the local traders. The village, which contains two or three store-houses belonging to Europeans, is situated in a grove of cocoa-nut trees, just behind a sandy beach. A reef of coral rocks, extending thence about  $\frac{1}{2}$  of a mile into the sea, renders it inaccessible to boats in a direct line; but in a narrow channel between the reef and the shore, near the *morai* to the S.E. of the beach, there is a good landing place. Within the village are several salt-pans,

\* "July 7th, 1837, at daylight, saw the outline of the island of Maui, and about eight the N.W. extremity of Hawaii. The heavy clouds capping the summits of both islands prevented our obtaining a glimpse of these remarkable peaks. The numerous cascades resulting from the showers afforded us a very interesting embellishment of the lower scenery, which we were passing within 3 or 4 miles of the breaker line. To seamen there is a peculiar enjoyment even in the sight of fresh water; but the numerous silver threads of it here sportively displayed must be seen to be duly enjoyed. No description can convey the idea of their number and variety, and a sketch including twenty leaps within one or two hundred yards would appear almost a burlesque, yet such was the fact." Sir EDWARD BELCHER, R.N. *Voyage of H.M.S. Sulphur*.

† "The N.E. side of Hawaii affords to the mariner a picturesque, but not inviting prospect; the land rises regularly and gradually to an elevation which loses itself in the clouds." . . . "The North point of Hawaii consists of low land, which rises in a straight line under an acute angle into the region of the clouds: as soon as you reach these parts, the Trade-wind has no longer any effect, and you may expect land and sea breezes, frequently interrupted by total calms, and light winds from every point of the compass." KOTZEBU'S *Voyage*, Nov., 1816.

and there is a convenient *watering-place* in a small sandy bay, where a fine stream empties itself. Kawaihae bay "is bounded to the north by two very conspicuous hills; towards the bottom of this bay there is foul, corally ground, extending upwards of a mile from the shore, outside which the soundings are regular, with good anchorage in 20 fathoms." (KING.)

VANCOUVER in Feb., 1793 anchored here "in 25 fathoms, bottom of fine sand and mud; the points of the bay bore by compass N.  $36^{\circ}$  W. and S.  $31^{\circ}$  W.; the *morai*, which is also conspicuous in pointing out this station, N.  $67^{\circ}$  E., and the watering place at the distance of  $1\frac{1}{2}$  miles, being the nearest shore, S.  $87^{\circ}$  E. On sounding round the ship, about  $\frac{1}{2}$  a cable's length to the S.W. of us was found a very small patch of coral rocks, where the water was only 10 fathoms in depth: on the opposite side, however, was clear good anchorage for near a mile, where many vessels might ride without inconvenience from the bottom, though nevertheless exposed to the violence of the winds and sea between the limits above mentioned, comprehending  $113^{\circ}$  in the western quarter."

Again, in February 1794, the same navigator brought up in what he considered "the best anchorage in this bay;\* the N.W. point bore by compass N.  $36^{\circ}$  W., and the *morai* N.  $68^{\circ}$  E.; this is a conspicuous object and a good leading mark to the anchorage; it is situated on a barren eminence to the southward of the village, and is to be kept in a line with a small saddle hill on the eastern land descending from the higher parts, over the village of Kawaihae, on the north side of this spacious open bay. Its south point, descending gradually from Hualalai, and forming a low point, bore by compass, S.  $31^{\circ}$  W.; within this point on the rising land are some elevated hummocks; the third of these from the point forming a kind of saddle hill in a line with a low, projecting, black, rocky point in the middle of the bay, bearing S.  $22^{\circ}$  W., is a further direction, and a cross mark for this anchorage; from whence the watering place lies S.  $79^{\circ}$  E.,  $1\frac{1}{2}$  miles distant. The summit of Mauna Kea also bore S.  $68^{\circ}$  E., Mauna Loa S.  $33^{\circ}$  E., and Hualalai S.  $5^{\circ}$  W. In this situation the depth of water was 25 fathoms, the bottom a stiff clay, and good holding ground; incommoded by the patch of rocky bottom, formerly stated to be at the depth of 10 fathoms only, but on a more minute search this was now discovered to shoal suddenly, and the depth to decrease to 7, 4, and 3 fathoms about  $\frac{1}{4}$  of a mile to the S.W.-ward of the station we had taken; and consequently to be a very great inconvenience to the roadstead, which at best, in my opinion, is but a very indifferent one, being entirely exposed to the N.W. winds, and the western oceanic swell, which beats with great violence on the reefs that encompass the shores."†

The country immediately east of this little settlement wears the appearance, from the sea, of being wholly formed of dark beds of lava, rising one above another, til they approach the highest summits. So much of the soil as lies along the coast, though rich, is badly watered, and 7 or 8 miles in the interior from the bay, it becomes exceedingly rocky and barren, presenting a burnt appearance until the eastern

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\* *Caution.* Whether the different hills in the vicinity of the bay, given as landmarks by VANCOUVER, are *in situ* now is uncertain; the whole of the coast for many miles south of Kawaihae has been considerably altered by the eruption of Hualalai in 1801, and that of Mauna Loa in 1869.

† DOUGLAS anchored here in 1789,—“the two extreme points of this large bay bearing from S.W. by S. to N.W. by N., distant from the shore 3 miles.”

side of the mountain is reached, when a dense forest and a most luxuriant vegetation succeed; here is the district of Waimea, already referred to, and which combines hills, valleys, plains, and mountains.

The high land eastward of Kawaihæ causes an almost perpetual calm in the bay and its vicinity; still, in the winter, when the Trades are uncertain, it frequently blows strong. At all seasons when under the lee of the elevated land, towards sunset, caution is necessary; about that time the wind not unfrequently rushes down between the mountain passes bounding the plain of Waimea with such violence as to be dangerous to shipping in the bay, and to reduce vessels in the offing to single or close reefs; these strong puffs are called by the natives "mumuku," and are foretold by an illuminated streak, seen far inland, believed to be caused by the reflection of the twilight on the mist that always accompanies the "mumuku." They are usually of short duration, and not felt beyond the first prominent headland to the southward, cape Kaelelulahula.

**Kaulano** point, the westernmost point of Hawaii, is in about lat.  $19^{\circ} 42\frac{1}{2}'$  N., long.  $156^{\circ} 5'$  W.; and the coast-line between the southern extreme of Kawaihæ bay and Kailua, where the next prominent place of anchorage is found, is not less than from 35 to 40 miles; here considerable changes have occurred since the visits of COOK and VANCOUVER; in 1801, the lava from Mauna Haulalai flowing in a westerly direction, reached the sea, and is said to have considerably extended the coast-line opposite to it; while the eruption of Mauna Loa in 1859 was of such an extent and duration that the lava reached the sea 15 miles south of Kawaihæ, destroying the fishing village of Wainanalii; for three successive weeks the volcano disgorged an uninterrupted burning tide into the ocean.

**Kailua**,—TIROWAY of DOUGLAS,—TYAHTATOOA of VANCOUVER,—the chief town of the island of Hawaii, was the seat of government of the whole group after the conquests of Kamehamela I., who died and was buried here; it has since greatly thriven through the energy of the first governors, who did their utmost in encouraging the industry of their countrymen. It has a few more inhabitants than some of the larger villages in the island, and being the centre for the transaction of civil business, is much frequented by the natives; it contains some stone buildings and a fort.

Kailua is situated at the head of a cove in a slight bend of the coast, which, though called a bay, scarcely deserves that name, being little better than an open roadstead, in which there is good anchorage. DOUGLAS thought "it superior in many respects to that of Kealakekua, the ground being extremely good, with not a spot of coral rock in any part of it; besides, vessels may lie at such a distance from the shore, that if the wind blows, they can clear the land with safety." VANCOUVER did not form so good an estimate of it; he anchored with the nearest shore  $\frac{1}{2}$  a mile distant: "the station we had taken was as close to the land as we could with prudence lie; and the bottom, in all directions where we sounded, was a mixture of rocks and sand; a considerable swell rolled in from the westward, and by the beaten appearance of the rock that chiefly composed the shore, this appeared to be in general the case; and for that reason not a very eligible resting-place for shipping; it, however, possesses an advantage with respect to landing superior to Kealakekua; this conve-

nience is produced by the jutting out of two points; between these is a small cove, defended by some rocks lying before it, which break the violence of the surge, and renders the communication with the shore very commodious; the landing is on a sandy beach, before a grove of cocoa-nut, bread-fruit, and other trees, in the midst of which is the village. Towards the south part of this cove is a spring, which rose very rapidly from among some rocks that are generally covered with the sea-water; but when this is low, as is sometimes the case, it is found to produce a stream of excellent fresh water."

KAMEHAMEHA's tomb near the beach, on the west side of the cove, is in lat.  $19^{\circ} 37' 20''$  N., long.  $156^{\circ} 1'$  W. according to DUPERRY.

The coast southward of Kailua as far as Kealakekua wears a very different aspect from that to the northward; perfect barrenness and desolation are exchanged for exceeding beauty, and at intervals along the shore there are villages situated amidst picturesque cocoa-nut groves. Here and there, also, according to native reports, are several small indentations of the coast in which anchorage for small vessels may be found.

**Kealakekua bay**—KAKAKAKOOA of COOK and VANCOUVER—signifying "the path of the gods," derives its name from a slide in the hill, which is still visible, which the gods are said to have used in order to cross the bay quickly. It will be ever memorable from its being the place where our illustrious navigator, COOK, the discoverer of the whole group of islands, lost his life; at present no monument except the stump of an old tree, to which is affixed a small plate of copper with a brief inscription on it, marks the spot.

The bay is of no great extent; wide, but not so deep that it would have formed a harbour or safe anchorage upon any but a western shore within the latitudes of the Trade-winds; it opens between two low and barren hills, on each of which is a town or village. Between them a high perpendicular bluff rises directly from the water, in which are seen numerous caves; in these the natives formerly buried their dead; the caves appear inaccessible, and are the resort of vast numbers of birds.

COOK anchored here "in 13 fathoms water, over a sandy bottom, and about a  $\frac{1}{2}$  of a mile from the N.E. shore; in this situation the south point of the bay bore S. by W., and the north point W.  $\frac{1}{2}$  N.; we moored with the stream-anchor and cable to the northward. The bay is about a mile in depth, and bounded by two low points of land at the distance of half a league, and bearing S.S.E. and N.N.W. from each other. On the north point, which is flat and barren, stands the village of Kowlowa (*now* Kaawaloa); and, in the bottom of the bay, near a grove of tall cocoa-nut trees, there is another village of a more considerable size, called Kakooa (*now* Napupu or Kealakekua); between them runs a high rocky cliff inaccessible from the sea. On the south side, the coast, for about a mile inland, has a rugged appearance; beyond which the country rises with a gradual ascent, and is overspread with cultivated inclosures and groves of cocoa-nut trees, where the habitations of the natives are scattered in great numbers. The shore all round the bay is covered with a black coral rock, which makes the landing very dangerous in rough weather, except at the village of Kakooa, where there is a fine sandy beach, with a *morai*, or burying-place at one extremity, and a small well of fresh water at the other."

VANCOUVER, in February, 1793, moored "with the best bower to the S.S.W. in 22 fathoms, and the small one E.N.E. in 12 fathoms water, soft sandy bottom: the

points of the bay lying S. 5° W. and N. 87° W. distant from Kakooa, the nearest shore, about the length of  $1\frac{1}{2}$  cables."

Cook made the anchorage of Kealakekua in lat. 19° 28' N., long. 156° W.—on the charts it is placed in long. 155° 55' W.

It has been proposed to establish a *light* on the point where Cook was killed.

**To the southward of Kealakekua bay** there are several populous villages along the sea-shore; and the S.W. part of the island, though it wears a very dismal aspect, has many patches of rich soil carefully laid out in plantations; the neighbouring sea also abounds with a variety of most excellent fish. "Off this part of the coast we could find no ground at less than a cable's length from the shore, with 160 fathoms of line, excepting in a small bight to the eastward of the south point, where we had regular soundings of 50 to 58 fathoms over a bottom of fine sand." (Cook.)

**WINDS.**—The prevailing winds on the west side of Hawaii are the land and sea breezes, which are very regular. From May to September is the wet or rainy season, when severe gales from S.W., lasting from a few hours to two or three days, may be expected. In December, January, and February, the weather is usually very dry, and the winds prevail from the north, from which quarter it sometimes blows fresh.

The **channel between Hawaii and Maui**, the next island to the northward, is 26 miles wide and free from any danger.

**MAUI** (Mowee of Cook).—This island lies between lat. 20° 33½' and 21° 4' N., and between long. 156° 3½' and 156° 39' W.; it is 37 miles long (W.N.W. and E.S.E.), and, being very irregular in outline, varies in width from 20 to 4 miles. It consists of two mountain masses connected by a narrow low isthmus only a few feet higher than the beach, so that, at a distance, it appears like two distinct islands. Although on first view these mountains resemble each other, on closer examination they are found to be very different. East Maui is much the higher, consisting chiefly of Haleakala and its immense slopes,—the mountain being one unbroken mass rising to an elevation of 10,200 feet, and falling in many places almost perpendicularly towards the sea. West Maui has many sharp peaks and ridges, which are divided by deep valleys, and which, in descending towards the sea, open out and form sloping plains of considerable extent on the north and south sides; Mauna o' Eeka, the highest peak of West Maui, is only 6130 feet above the sea.

Maui is divided into eleven districts; those of Hamakua, Hamakualoa, and Kulau lie on the N.E., Hana on the east, Kipahulu, Kaupo, and Kahikinui on the south, Honuaulu, Kula, and Lahaina on the S.W., and Kaanapali on the N.W. East Maui contains the most arable land,—as well as several sugar plantations. The district of Kula on the S.W. side of the island, though rough and rocky, has a loamy, rich, and productive soil; here are the extensive arable plains which a few years ago supplied the Irish potatoes, with which a brisk trade was carried on with California, and from which at present the whalers are furnished with most of their supplies; it also grows wheat, indian corn, turnips, melons, &c. At Makawao are the wheat lands; here the cultivation of cereals has been a success, and is still increasing.

The isthmus of Waikapu lies but little above the level of the sea, and is composed principally of dry sand; since the goats and cattle have been allowed to run there

they have destroyed the vines and bushes which served to confine the sand on the windward side, and the dunes have been driven nearly to the leeward beach, and will soon usurp the whole of the lower part of the isthmus. During nine months of the year parts of this district afford fine grazing for large herds of cattle. Towards the windward side, are the cultivated portions of Waikapu and Wailuku, which, with the valleys and upland behind them, are very fertile. The level plain of Lahaina, composed of the alluvial washed from the hills in the rear of the town, is remarkably rich, and capable of producing largely of most kinds of fruits and vegetables. Grapes grow rapidly, bear profusely, and are of a fine flavour. With these exceptions, most of West Maui not inaccessiblely mountainous, is grazing land.

KING describes the island as being visible at the distance of 30 leagues; "the northern shores, like those of Hawaii, afford no soundings; and the country presents the same appearance of verdure and fertility. To the S.E., between this and the adjacent isles, we had regular depths with 150 fathoms, sandy bottom. From the west point, which is low, runs a shoal, stretching out toward Lanai, to a considerable distance; and to the southward of this, is a fine spacious bay, with a sandy beach, shaded with cocoa-nut trees. . . . We were informed by the natives, that there is a harbour to the southward of the east point;" this was not confirmed by VANCOUVER, from whom the following description is taken:—

**The south point of Maui**—cape Kahiki—is formed by rugged craggy rocks, and the sea breaks at a little distance to the N.W. of it: on approaching these breakers soundings are found, suddenly decreasing from 25 to 10 fathoms, rocky bottom; on hauling off shore, almost instantly the depth increases to no bottom with 80 fathoms. . . . The south and S.E. coasts terminate very abruptly in the ocean, and though the surface is very uneven, they wear a verdant and fertile appearance.\* . . . "In beating round the western part of the island, which does not terminate in a projecting point, but forms a large rounding promontory, we very anxiously looked out for the harbour mentioned by Capt. KING, as reported by the natives to exist in that neighbourhood, but nothing was seen that could warrant such a representation, excepting two small open coves situated on each side of the eastern extremity of the island. Off the eastern extremity—cape Hana—lies a small islet, with some rocks between it and the shore. To the north of this islet is a remarkably elevated hummock, rising almost perpendicularly from the sea, but gradually descending in a slope inland; it was covered with a pleasant verdure, and occupied by several houses, but destitute of trees or shrubs. The adjacent country was moderately elevated, presented a fertile appearance, and seemed to be thickly inhabited, as far back as the

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\* LA PEROUSE (1786) coasted this part of the shore of Maui, at the distance of a league; the aspect was delightful; "we beheld water falling in cascades from the mountains, and running in streams to the sea, after having watered the habitations of the natives, which are so numerous that a space of 3 or 4 leagues may be taken for a single village; but all the huts are on the sea-coast, and the mountains are so near, that the habitable part of the island appeared to be less than half a league in depth. The trees which crowned the mountains, and the verdure that surrounded the habitations, produced inexpressible charms to our senses; but the sea beat upon the coast with the utmost violence." LA PEROUSE brought up off the S.W. end of Maui,—to the S.E.-ward of Molokini islet.

foot of those mountains that compose the eastern part of the island. As we passed this rounding promontory some detached rocks were noticed lying about  $\frac{1}{2}$  a mile from the shore. . . . A very heavy surf beat on the low sandy shores of the open bay on the north side of the isthmus.\* . . . The north point of the island—Kana-pali point—is steep and cliffy; off it lie an islet and some rocks at a small distance from the shore (VANCOUVER, 1794).

“The north coast of East Maui is an succession of deep ravines which gradually diminish in breadth as they ascend, and are finally lost on the flanks of the mountains: travelling along the coast, in consequence, becomes almost impossible. Cascades are seen falling in these ravines several hundred feet in height, having little volume of water however” (WILKES, 1840).

BROUGHTON mentions an anchorage off the S.W. end of Maui, a little to the southward of a remarkable round hill, on a sandy beach, projecting its rocky base into the sea. Its top, having the appearance of a crater, acquired for it the name of Volcano hill. It lies N.  $26^{\circ}$  W. about a league from the south point of Maui, directly opposite the barren and uninhabited islet of Molokini; here were regular soundings from 25 to 15 and 7 fathoms, sandy bottom, within  $\frac{1}{2}$  a mile of the shore. The beach, about  $\frac{1}{2}$  a mile long, appeared very convenient for landing upon; but good water was not to be procured even in small quantities within a considerable distance, and its neighbourhood was barren.

VANCOUVER (1793) passed through the channel between Molokini and Kahului, worked up into the large bay on the S.W. side of Maui, lying before the low isthmus, and anchored in 39 fathoms towards the eastern side, distant 2 miles from the nearest shore. Here the Trade-wind from N.E. came at intervals in furious squalls over the lowland, and a strong current set to S.E.; he then weighed for the *village* of Lahaina, more to the north, and brought up under the directions of a native pilot, in 25 fathoms, bottom of sand, stones, and coral; in this roadstead there was good protection by the surrounding land, excepting to S.S.W.; Volcano hill bore S.  $54^{\circ}$  E., Molokini S.  $46^{\circ}$  E., Kahului S.  $35^{\circ}$  E. to S.  $7^{\circ}$  E., Lanai S.  $54^{\circ}$  W. to N.  $78^{\circ}$  W., the westernmost part of Molokai in sight N.  $66^{\circ}$  W.; and of the two low projecting points of land from the shore of Maui, forming the points of the roadstead, the northernmost bore N.  $26^{\circ}$  W., distant  $4\frac{1}{2}$  miles,—the southernmost S.  $64^{\circ}$  E., distant 5 miles; and the nearest shore N.E. by E.  $\frac{1}{2}$  a league distant.

Lahaina to the N.W. of this roadstead is described as a village of some extent, pleasantly situated on a space of low or rather gently elevated land, in the midst of a grove of bread-fruit, cocoa-nut, and other trees; to the eastward the shores were bounded by a reef, on which the surf seemed to break with so much force as to preclude any landing with the boats; the inhabitants seemed poor.

Boat excursions were made from the ship for the examination of the coast. To the N.E.-ward 7 miles from where VANCOUVER brought up is Patoa, a roadstead with good anchorage in from 10 to 20 fathoms, sandy bottom; the former depth within  $\frac{1}{2}$  a mile, the latter within a mile of the shore, where there is an excellent run of fresh water. The soundings from the ship were regular all the way to Patoa, and the station may

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\* Cook brought up on this side of the isthmus in 35 fathoms.

be found from the following description :—the large bay lying before the isthmus has its western side formed by high rocky precipices rising perpendicularly from the sea ; to the westward of these precipices the coast is chiefly composed of sandy beaches, and the mountains, at some distance from the shore, form two remarkable valleys, separated from each other by a high rugged mountain, seemingly detached from the rest, and approaching nearer to the beach than those to the right and left of it ; the anchorage of Patoa is abreast of the easternmost of these valleys.

Proceeding along shore to the eastward, the same soundings were found until abreast the rocky precipices ; here there was no ground, but closer to the shore the bottom, which is rocky, was reached at 20 fathoms. These precipices extend about a league from Patoa, in the line of the shore, then trend more northerly, and at the distance of about 4 miles join the low land of the isthmus ; before this lies a reef or rather detached patches of rocks, at the distance of near a  $\frac{1}{4}$  of a mile from the shore, outside which the soundings are regular and good. The western side of the large bay is formed by these precipices or cliffs ; its opposite shore, about 4 miles distant, takes a north direction from Volcano hill ; the depth of the bay is here somewhat increased ; the soundings on the eastern side are regular but very rocky. This is the Kamalea bay of the charts.

Near the middle of its western side is the village of Mackerrey ; off this is anchorage in 7 fathoms, a little more than a  $\frac{1}{4}$  of a mile from the shore, bottom of sand and broken coral ; it is land-locked in every direction, except about two points to the S.W.-ward ; the landing is good ; this was the limit of examination to the eastward.

Proceeding next round the western point of Lahaina roadstead, the shores were found to be bounded by a reef, which admits of only one landing-place for boats, and that a very indifferent one, at the eastern part of the village ; from the ship to the shore the soundings were regular, decreasing to 5 fathoms close to the reef, extending in general about a  $\frac{1}{4}$  of a mile from the beach, and not exceeding that distance from the west point of the roadstead, where, on the north side of that point, the reef terminates. This point, with the west extremity of Maui, which is bold and free from rocks or other impediments, forms an excellent little bay ; its outer points lie from each other N.  $14^{\circ}$  W. and S.  $14^{\circ}$  E., about a league asunder. The northern point is formed by a round hill close to the water-side and resembling Volcano hill. This bay seemed the most eligible anchoring place in Maui ; the soundings, in the line of the two points, from 10 to 14 fathoms, soft sandy bottom, regularly decreasing to 5 fathoms close to the beach, which is protected from the ocean and the prevailing winds by its north point locking-in with the eastern part of Molokai ; it is free from rocks and shoals ; and it affords pleasant landing and good anchorage ; vessels may lie nearly land-locked in every direction excepting that between Lanai and Molokai, in the western quarter ; this space embraces but a small extent, from whence little danger can be apprehended ; the shores afford very excellent water.

Notwithstanding the advantages of Patoa and Mackerrey, there is reason to suspect that the bottom at those places, as well as on all this side of Maui, is nowhere good holding ground. That of the roadstead of Lahaina, I am convinced, is nothing more than a very slight covering of sand over a bed of hard coral ; the same remark seems to extend to the edge of the bank, where, in 40 fathoms water, the bottom is much *softer*, but the declivity of the bank is such, that with a strong wind

from the shore, vessels would not be able to retain their anchorage. . . . The soundings off the S.W. part of Maui indicate the same deceitful bottom; this can only be discovered by anchoring upon it, as the lead only brings up the sand and small stones that cover a bed of solid rock, beneath which the anchor cannot penetrate. (VANCOUVER.)

**Lahaina** is a vastly different place now—with its store-houses, churches, chapels, and seminaries—from what it was in the days of VANCOUVER. The town is built along the beach for a distance of upwards of a mile; it is principally composed of grass-houses situated as near the beach as possible. The garden-like appearance of the place, with its luxuriant verdure, attracts the eye of the stranger, and creates a favourable impression. Situated on a low, well-watered flat at the base of the mountains, which rise quite abruptly, forming a picturesque background, it possesses an excellent site for a thriving port; it must, however, be confessed it looks far prettier from shipboard than it does from its narrow and dusty lanes. There are several European dwelling-houses and stores; and it has a fortress of inconsiderable importance, which serves for the residence of the governor of the island. The landing for boats, which was formerly a safe though narrow channel, has of late become partially filled up and destroyed by the sand thrown up by the sea—the effect, it is said, of a partially constructed sea-wall. The surf at times breaks entirely across the channel, rendering boats liable to be capsized. The beach is every year making out further seaward, and has advanced at least 20 feet since 1855.

Lahaina still possesses the superior advantage for recruiting whaleships which it has ever had; the crews are more easily kept in order here, and have not that temptation to visit the shore that is experienced at Honolulu.

All the usual productions of the islands may be obtained in abundance at Lahaina except *taro*; and it is especially famous for its luscious fruits.

A *fixed white* light, visible to the distance of 6 miles, is exhibited at this port, and the position given is lat. 20° 53' N., long. 156° 35' W.

KALEPOPELO and MAKEE'S LANDING are places on the S.W. side of Maui.

**KAHULAI** (TAHOOROWA of COOK) lies off the S.W. point of East Maui; it is about 12 miles long (S.W. by W. and N.E. by E.), and 6 miles wide in its broadest part; in the channel between the two islands, which varies from 6 to 8 miles in width, is the small islet of Molokini, which being high and conspicuous is not dangerous to shipping. Kahului was formerly a penal settlement, but is now used as a sheep pasture; and the natives occasionally go over there for a few months for fishing purposes, or during the rainy season to plant melons and sweet potatoes. The island is destitute of wood.

*Shoal*.—The shoal seen by COOK off cape Kealahiki, the west extreme of Kahului, was examined by WILKES, who says, "it lies 1½ miles off the point, and has 1½ fathoms of water on it; vessels may pass within 2 miles of the point with safety, but as it is difficult to estimate the distance, it will be better to pass the point at 3 miles' distance, as nothing is lost by so doing. It is remarkable that this is the only shoal around the Hawaiian islands that is hidden from the navigator, and this is situated so near the land that it can scarcely be deemed dangerous."

*There is no evidence of active volcanic agency on the island.*

**MOLOKINI** (MOBOKINNE of COOK) is a small, bare, uninhabited islet in the channel between Kahulaui and East Maui,—nearer the latter than the former; it is occasionally used by the natives as a place on which to dry their nets.

**LANAI** (BANAI of COOK).—This island, distant 20 miles N.W. by W. from Kahulaui, is 15 miles long (N.W. by W. and S.E. by E.), and 8 miles broad in its broadest part; it lies west of West Maui, from which it is separated by the Auau channel, which, where narrowest, is not over 8 miles wide, and the Maui side is fringed with coral reefs and shoals. Lanai is dome-shaped and appears to have been frequently rent by volcanic agency, large fissures being apparent on its sides. The south end is high and craggy, and in the ravines and glens small trees abound; the other parts of the island, however, wear a better aspect; but on the whole it is comparatively sterile, for though higher than Kahulaui, it is still too low to receive a large quantity of rain; there is some good land upon it nevertheless, but the population is scanty. There is but one permanent stream on the island, that running down the valley of Maunalei, which opens to the N.E., directly facing Kaluaaha on Molokai. It produces good yams, sweet potatoes, and taro.

It is said that Lanai if turned bottom up into the crater of Haleakala, on East Maui, would about fill it.

**MOLOKAI** (MOBOTOI of COOK).—This island lies north from Lanai, and N.W. from Maui, being separated from the latter by the Pailolo channel, which is 6 miles wide in its narrowest part; the channel between Lanai and Molokai is not over 3 miles wide. The island is 38 miles long (W. by S. and E. by N.), but only 7 miles wide in its broadest part,—thus, though it preserves the character of being mountainous, it differs essentially in horizontal outline from all the rest of the group, being very long and narrow; the eastern end is much the higher, rising in parts to an elevation of 2000 and 2500 feet, and sloping off gradually towards the west.

VANCOUVER (in 1793) stood over to Halana, the N.E. point of Molokai, until within a league of the shore, which was bounded by a reef extending about  $\frac{1}{2}$  a league from it; sailing along to the westward he saw several shallow breaks forming passages for boats, but not affording any shelter for shipping against the prevailing winds; half a league south of the point lie the small barren rocky islets of Modu. Here the land rises rather abruptly from the sea towards the lofty mountains in the centre of the east part of Molokai: and though the acclivity is great, yet the face of the country, diversified by eminences and valleys, bears a verdant and fertile appearance. It seemed well inhabited, in a high state of cultivation, and presented not only a rich but a romantic prospect. The cliffs terminate in a low point of land called Crynoa, which is the S.E. point of the island. The mountains forming the eastern part of the island gradually descend to the westward, and like those of Maui, terminate on a low isthmus, which appears to divide the island into two peninsulas; these however bear no proportion to each other; the easternmost, which is far the larger, is composed of very high land, but the westernmost does not rise beyond a mean height. The country from Crynoa rises from the sea by an ascent uninterrupted by chasms, hills, or valleys. Cape Kalaau, the west point of the island, is distant from Crynoa point about 32 miles; the intervening south shore of the island

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is generally a sandy beach, but there are no projecting points for shelter. From cape Kalaau to cape Kaluakoa, the N.W. point of the island, the distance is about 3 leagues; between these two points a commodious bay had been stated to exist, but the whole intermediate space is nearly a straight shore, composed alternately of rugged rocks and sandy beaches; VANCOUVER anchored for the night in 19 fathoms water, sandy and bad holding ground; in working up, the soundings were pretty regular from 17 to 60 fathoms, fine sandy bottom; "the anchorage was within a mile of the breakers,—the west point bearing South, distant 4 miles,—and the N.W. point N. 26° E. about the same distance; this situation is as close as vessels can lie with safety, exposed as this (the N.W.) side of the island is to North and N.W. winds which frequently blow with great violence, and to a heavy sea that is almost constantly rolling from that quarter on the shores; landing would have been dangerous even in canoes." (VANCOUVER, March, 1793.)

WILKES (1841) says,—“One-third of the island, towards the western end, is a barren waste not susceptible of cultivation except in the rainy season; the eastern two-thirds are almost one entire mountain, rising gradually from the south, until it attains an elevation of 2500 feet, while on the north it is almost perpendicular. On the south side is a narrow strip of land not exceeding one-fourth of a mile in width, the soil of which is very rich; owing, however, to the lack of moisture, few plants thrive here; resort is therefore had to the uplands, which are found to be susceptible of the highest degree of cultivation. There are several small harbours within the reef, on the south side, at **Kaluakoa** (the missionary station), which are capable of affording shelter for vessels of from 60 to 80 tons. The island has been occupied as a missionary station since 1832.”

Passing the east end of Maui and coming suddenly on Molokai the view is very singular; four exactly parallel outlines of picturesque and lofty cliffs appear almost a visual deception, or the effect of quadruple refraction: but on advancing it will prove to be a reality,—height about 400 feet, and varying but slightly from the perpendicular: here also, as on Maui, several very pretty but loftier cascades embellish the scenery, which attired in nature's clothing only, is rich in colours. (Capt. Sir E. BELCHER, R.N., 1837.)

On the windward side of Molokai there is not much arable land, the greater part of the coast being formed by bold precipices of bare lava rock, rendered wild and jagged in appearance by frequent gulches and ravines; the natives, in speaking of the island, term it *Ka-aina-pali*—a land of precipices. Some of the windward portions for a large part of the year can be approached only by sea, and that in good weather,—the foot-paths over the mountains being often impassable. The leeward side having a much more gentle slope to the sea—contains some fine land both for culture and grazing. Some of the valleys towards the eastern end present scenery unsurpassed in magnificence. The western end of the island is too low and dry to be worth much, unless perhaps for sheep pasture. There are some dairy-farms in Molokai from which excellent butter is sent to the Honolulu market,—and occasionally some very fine cattle. Since 1853 the population has been gradually increasing; the people are apparently more industrious and enterprising, and also healthier, *than those of most of the other islands of the group.*

*It is said that the indentation in the coral reef on the leeward side of the island, at*

a place called *Kalaie*, might, at a moderate expense, be converted into a good harbour for coasters; at present only very small vessels can get over the bar.

**OAHU** (WOAHOO of COOK).—This island, separated from Molokai by a channel having an average width of 20 miles, lies between lat.  $21^{\circ} 13'$  and  $21^{\circ} 44'$  N., and between long.  $157^{\circ} 37'$  and  $158^{\circ} 16'$  W.; it is 39 miles long (N.W. by W. and S.E. by E.), and being, like Maui, very irregular in outline, has a breadth varying from 18 or 20 to 7 or 8 miles. Commercially it is the most important island of the Hawaiian group; and, in 1866, contained 19,799 inhabitants.

The general impression on the mind, derived from the aspect of nature as viewed under favourable or unfavourable circumstances, cannot be better illustrated than from the descriptions given of Oahu by COOK and by WILKES, and they serve to show how inaccurate an estimate may be formed from a partial observation. COOK passed along the *windward* side, and he says "it is by far the finest island of the group: nothing can exceed the verdure of the hills, the variety of wood and lawn, and rich cultivated valleys which the whole face of the country displayed." On the other hand WILKES says "the appearance of Oahu is by no means inviting; it has a greater resemblance to the desert coast of Peru than any other of the Polynesian islands we had visited, and has as little appearance of cultivation: the country would be termed at first sight barren and rocky: the land in places is very much broken, and rises into high ridges, here and there divided by deep and narrow ravines, with little vegetation, except on the mountain ranges: from the published descriptions of the Hawaiian islands I was prepared to see them, and particularly Oahu, a perfect garden: I was inclined to impute my disappointment to our approach being made on its *lee* side, which is unusual; but I regret to say that any side, when seen from the sea, is very far from having an inviting appearance."

Oahu is divided into six districts,—Kona and Ewa on the south, Waianae on the S.W., Waialua on the N.W., Kulauloa on the north and N.E., and Kulau on the N.E. and east. The contour of the island is due to two ranges of mountains, the highest of which, Konahuanui at the pass of Nuuanu, is about 4000 feet above the level of the sea. One of these ranges runs from Makapuu point (the east end of the island) along the windward side till it sinks into the low plain of coral rock at Kahuku. The other (or Waianae range) commences on the leeward side of Ewa, near Barber point, and after running nearly parallel with the first range for a distance of 10 or 12 miles, diverges at a sharp angle and terminates at Kaena point—the west point of the island—leaving the Waialua district on the right or windward side. The first range presents to windward for almost its whole length a perpendicular wall of rock several thousand feet high with comparatively level land extending from its base to the sea, varying in width from nothing, as at Makapuu *pali*, to 6 or 7 miles opposite the *pali* of Nuuanu. Through this low land at intervals are thrown out from the main range several ridges or spurs of hills, usually ending at or near the sea with an extinct crater. The soil of the low land is generally good, and pretty well watered. The climate, as on the windward side of all the islands, is more moist and several degrees cooler than on the leeward side.

The leeward side of the mountains presents a gentle slope. The Kona or Honolulu district is divided like the Kulau or windward district, by the spurs of the moun-

tains, into three distinct divisions. The first is of some 3 or 4 miles extent, from Makapuu to Koko head; the second from Koko head to Diamond head, 10 or 12 miles; and the third from Diamond head to Moanalua ridge, including the city of Honolulu, some 8 to 10 miles. Had Punchbowl hill extended further seaward, it would have made another division.

**Honolulu**, the seat of government and the commercial emporium of the islands, is situated on the leeward and southern side of Oahu, on a narrow plain directly opposite the beautiful valley of Nuuanu. Its situation was unknown to COOK, VANCOUVER, and the early visitors to the islands; and fifty years ago it was an inconsiderable place of about two hundred huts, built of dry grass, and inhabited by the natives, who subsisted by fishing and the cultivation of *taro*, with a few houses of unburnt brick or wood, occupied by some chiefs and a few Europeans. It gradually rose in importance as it came to be more and more frequented by British and American traders and whalers; and the situation being good, it was eventually established as the capital of the Hawaiian kingdom, the residence of the consuls of foreign courts, and the chief port in the best channel of intercourse between the eastern coasts of the old, and the western coasts of the new, world. The central part of the city now consists of regularly laid out streets, on either side of which stand houses and warehouses constructed after the European style, generally painted, and frequently placed within spacious enclosures with gardens, while its outer portions are still chiefly composed of grass huts inhabited by the natives. Besides these, there are the king's palace, a fort, numerous churches and chapels, public offices, a custom-house and a sailors' home; also ample wharves, foundries, workshops, and ship-yards to meet any emergency that may arise, even to making a steamship if ordered. The city has slowly but constantly increased in size during the past ten years, and its population now amounts to about 15,000. It has a fine capacious harbour, formed by the coral reef, capable of accommodating 200 vessels at a time, and is perfectly safe in all weathers.

From Moanalua ridge to Barber point and the commencement of the Waianae mountains, is the Ewa district. The most remarkable feature of this is the so called Pearl river, a large and irregular shaped lagoon, greatly cut up by projecting points and islands, and the water of which is somewhat freshened at its inland extremities by the streams that run into it; it is connected with the sea by a tolerably wide passage, and its main channels and open spaces are, with the exception of the bar at the mouth, deep enough for any vessel. The extensive flats between it and the sea, and those that stretch off beyond it for 7 or 8 miles to Barber point, with a width of 5 or 6 miles, are generally dry and barren, being great stretches of clinkers, broken masses of all sizes, with solid rock beneath of feldspathic lava, with here and there a deep pit or sudden crevice; bushes and scattered tufts of grass keep fat the cattle that range there, and occasionally serve to conceal the mouth of a pit from unwary cattle or horses.

Along the inland shore of Pearl river is a strip of very fertile land, and of variable breadth, some of which is now cultivated with *taro* and bananas; but a large proportion is lying idle. Then the land rises gently to the elevated plain which extends between the two mountain ranges mentioned previously, towards Waialua, descending somewhat more steeply into the lowlands of Waialua at a distance of 2 or 3 miles

from the sea. This plain is interrupted by several deep gulches,—something like the Californian *canons*, which yawn in the traveller's face with scarce any warning. Their courses are very irregular,—one runs from the main range of mountains zigzag across the plain towards the Waialua mountains, until at about the elbow or angle, when it turns and follows along their base to the sea at Waialua.

The slopes of the mountains on the right from Moanalua to Waialua present much land in the valleys and on the small elevated plains, which, were the island fully peopled, would undoubtedly well repay cultivation. In some of the valleys large quantities of excellent oranges are raised. Most of the plain, about 9 miles by 12, is grazing land. The heads of the valleys, and the ridge of the main range are heavily timbered with *kukui*, *ohia*, and some *koa*, and occupied now only by wild cattle and hogs. Turkeys and chickens too are numerous—estrays from domesticated stock. The Waialua flat, some 2 or 3 miles by about 5, is very fertile, and the climate to many more agreeable than that of Kulau or Honolulu. From Waialua to Kahuku the surface is hilly, and merely a good pasture. Kahuku is quite a level plain, some 5 or 6 miles by 2, extending from Waimea to Kahuku point. It is but slightly elevated above the sea, and consists of soil-covered coral in position, evidently little disturbed by its upheaval. At many of the frequent holes and crevices in it may be seen streams of fine clear and cool fresh water, making their subterranean way three or four feet below the surface from the mountains to the outlets in the sea below low water mark.

The Waianae district, protected by its mountain range from the Trades, and exposed fully to the afternoon sun, is for the most part very warm, though a strong gust from the Trade wind will sometimes break over with violence. But a small portion of Waianae is arable land, by far the major part being devoted to grazing purposes, for which it is admirably adapted, producing probably the best beef on the island.

The main range of the Oahu mountains has a break or passage through it at the Nuuanu valley, often described as the celebrated "pali of Nuuanu," and is passable for foot travellers at the heads of several of the valleys. The Waianae mountains have but one path over them, that near the elbow at Lihue—other access or exit to or from the district is only by water or round the Ewa or Kaena ends of the range. This last is a difficult and at times a dangerous path.

"The mouth of the valley of Nuuanu, which opens just behind the town of Honolulu, is a complete garden, kept in a high state of cultivation; and the ground, being irrigated by the water from a river that winds rapidly down the valley, is remarkably productive. The valley rises with a gradual ascent from the shore to the precipice, or *pali*, which is 7 or 8 miles from the town. After walking about 3 miles through one unbroken series of plantations, the valley becomes gradually narrower, and the mountains rise more steep on either side. The scenery is romantic and delightful: the bottom of the valley is gently undulating; a rapid stream takes its serpentine way from one side of the valley to the other, sometimes meandering gently along, at others rushing down a fall of several feet, or dashing and foaming among the rocks that interrupt its progress. The sides of the hills are clothed with verdure; even the barren rocks that project from among the bushes are

ornamented with pendulous or creeping plants of various kinds; and, in several places, beautiful cascades roll their silvery streams down the steep mountain's side into flowing rivulets beneath. The beauty of the scenery increases, until, after ascending a rising ground more steep than usual, and through a thicket of *Aspidiscus* and other trees, the traveller suddenly emerges into an open space, and, turning round a small pile of volcanic rocks, the "*Pali*" all at once burst upon him with an almost overwhelming effect. Immense masses of black and ferruginous volcanic rocks, many hundred feet in nearly perpendicular height, present themselves on both sides to his astonished view; while, immediately before him, he looks down the fearful steep several hundred feet, and beholds hills and valleys, trees and cottages, meandering streams and winding paths, cultivated plantations and untrodden thickets, and a varied landscape many miles in extent, bounded by lofty mountains on the one side, and the white-crested waves of the ocean on the other—spread out before him as if by the hand of enchantment." (Rev. Mr. ELLIS.)

Each of the above districts of Oahu has, even at the same elevation above the sea, its peculiar climate, perceptible to an ordinary observer. The difference is due to different degrees of moisture and of exposure to or shelter from the Trade winds. Those winds are also modified very much by the extent of land over which they have blown after leaving the sea, and by the character of that land—as covered with verdure, or bare rock and earth made scorching hot by the rays of the sun.

Oahu is more properly and naturally a grazing than an agricultural island, though the amount of arable land scattered at intervals over its surface is amply sufficient to support a large population.

"From its East point the N.E. side of Oahu takes a direction N. 35° W., off which are scattered some small detached islets and rocks; the northernmost of these which we saw, is a low flat rock, lying from the east point N. 22° W., 3 or 4 leagues distant; and near the shore was a hill whose summit bears the appearance of a volcanic crater: the land to the north of the east point seemed much indented. . . . On the S.E. part of this island are two remarkable promontories, which lie from each other S. 81° W. and N. 81° E., about 7 miles asunder; the easternmost of these is formed of barren rocky cliffs, rising so suddenly from the sea that to all appearance vessels might brush their sides in passing them; whence the land falls a little back, and forms a shallow bay in a northern direction, where the different colours in the water indicated a rocky bottom; on the beach the surf broke very violently, behind which a lagoon extended some distance to the northward: should the bottom be found good, vessels might ride in this bay tolerably well protected against the general Trade-wind." (VANCOUVER.)

**Waiala.**—In the bay, to which reference has just been made, and which lies between Kawaihoa or Koko point (the S.E. point of Oahu) and Diamond or Lealu point, PORTLOCK brought up in June, 1786, in 12 fathoms water, over a bottom of speckled sand and broken shells; the east point of the bay bore E. by N. 1½ miles; the west point W.S.W. ¼ W. about 2 leagues; the bottom of the bay, North, 2 miles distant. On a subsequent occasion (Nov. 1786) he brought up in 12 fathoms, bottom of grey sand intermixed with small red specks; the east point, E. ¼ S. 1½ miles; the west

point W. by S. 6 miles; the bottom of the bay N.W.  $\frac{1}{2}$  N. 2 miles.\* There is a village on the N.W. side of this bay called Waiala.

VANCOUVER did not anchor in this bay but, continuing his course, hauled round the reef, which lies about a  $\frac{1}{2}$  of a mile from the point, and had soundings from 22 to 10 fathoms; in which latter depth of water he anchored, bottom of sand and pieces of small coral. "This promontory, which is the south point of the island, has also on its top the appearance of a crater; it bore by compass N.  $82^{\circ}$  E.; the outward part of the reef S.  $81^{\circ}$  E.; the westernmost part of the land in sight N.  $82^{\circ}$  W.; a break in the reef, which extends at irregular distances along the shore,

\* PORTLOCK, in his "Voyage Round the World," calls this King George bay; the east point he names point Dick, and the west point, point Rose; the character of this bay is derived from the following narrative of his proceedings;—they landed on some rocks just round point Dick, and finding very little fresh water, were informed by the natives that it was to be procured only at a considerable distance to the westward. They returned to the boats and rowed to the northward, close to a reef, which appeared to run quite across the bay, about a  $\frac{1}{2}$  of a mile distant from the beach; having proceeded a mile in this direction, a small opening in the reef presented itself, for which they steered. The channel was narrow, but in the middle they had 2 fathoms water; and after getting through, there was from 3 to 4 fathoms over a bottom of fine sand, and good room between the reef and the beach for a number of vessels to ride at anchor; they landed on a fine sandy beach, and still finding no fresh water, walked a short distance along shore, until their progress was impeded by a little salt-water river that communicated with King George bay. They again had recourse to the boats and attempted to get to the westward within the reef, but the water was so shallow that it was impracticable: so they returned through the passage they came in at, and afterwards rowed to the westward, keeping close along the outside of the reef; they soon saw a small opening and made for it; passing in, the boat was nearly upset by a breaker, and after getting over the reef, they found the water so shoal that the boats could not get within 300 yards of the shore. The difficulty and risk attending the procuring of water here caused them to return to the vessels.

The next day the boats were sent to examine the west part of the bay for a landing and fresh water; an excursion was also to be made by land round point Rose, as there appeared to be a fine bay in that situation; on the return of the boats, it was reported that there was a pond of standing water in the west part of the bay, but it was very inconveniently situated; and that on walking to the rising ground, it was seen that the land round the west point of King George bay fell in and formed a fine deep bay running well to the northward, and the westernmost land stretched out to the southward.

PORTLOCK did not change his anchorage, in consequence of being well supplied by native aid with all he required; besides, he describes his situation as in many respects a very eligible one, being favoured with a most refreshing sea-breeze which blows over the low land at the head of the bay; and the bay all around having a very beautiful appearance, the low land and valleys being in a high state of cultivation, &c. He weighed however within a few days and stood under easy sail to the westward; as he approached point Rose the bay to the westward opened out; this he calls Queen Charlotte bay, and says it stretches well out both northward and southward. The southern extreme forms itself into a flattish point which he distinguished by the name of point Banks, and states it bore W. by N. from point Rose, distant about 12 miles. From each of these points there runs a ridge of rocks for about  $\frac{1}{2}$  of a mile, but they always show themselves by breakers, and coloured water. He ascertained that the district in Queen Charlotte bay, round Rose point, was called Whyteetee.

From these remarks it appears that Dick point is now known as Kawaihoa point, Rose point as Diamond point, Banks point as Barber point, and Queen Charlotte bay as the expanse between Barber and Diamond points; the bay between Kawaihoa and Diamond points is unnamed.

N. 20° W.; a low sandy point, near the west end of a large Indian village, N. 7° W.; and the middle of the village (where the natives informed us we might land in perfect safety with our boats) N.N.E. about 2 miles distant. We examined a considerable space around the ship, and found in shore the same description of bottom, though the coral which principally composed it was of so soft a nature as to cause little apprehension for the safety of our cables. The depth of water within us gradually decreased to 6 fathoms, and without, to the distance of nearly a mile, as gradually increased to 25 and 30 fathoms, where the bottom was found to be a fine grey sand. . . . The situation occupied by us in this bay, which the natives called Whyteetee, seemed nearly as eligible as most of the anchoring places these islands are generally found to afford." In another place he says "Whyteetee bay is formed by the land falling a little back round the south point of Oahu; and although open above half the compass in the southern quarters, it is unquestionably the most eligible anchoring place in the island. . . . The S.W. point of the island lies N. 82° W. 5 leagues distant. This point is low flat land, with a reef round it, extending about a  $\frac{1}{4}$  of a mile from the shore. The reef and low land continue some distance to the eastward towards Whyteetee bay, and form (between the south and S.W. points) a large, open, shallow bay, with high land rising very irregularly at some distance from the beach; which, towards the S.W. point, appeared to be broken in two places, and to form lagoons that seemed capable of receiving boats and small craft."\* Such is VANCOUVER's description of the coast between what are now known as Barber and Diamond points. When he visited Oahu the next year (1793) he brought up abreast of the westernmost opening or lagoon above referred to, called by the natives *O-poo-ro-ah*. "About  $\frac{1}{4}$  a mile from the reef that binds these shores, he found the soundings irregular from 5 to 15 fathoms, rocky bottom, but where the ship rode, the bottom was tolerably even, and composed of sand and coral; the depth of water about half a league from the reef was 25 fathoms." This was opposite what is now called the Pearl Loch harbour of Ewa, about 5 miles to the westward of the entrance to Honolulu.

**Waikiki.**—This is the village called WHYTEETEE by VANCOUVER; it lies on a hill-side near the shore, N.W.-ward from Diamond hill, and about 2 $\frac{1}{2}$  miles to the S.E.-ward of Honolulu, the plain of which, as well as that of Ewa, it overlooks. Off the village there is anchorage (somewhat exposed) and the reef between it and Honolulu is extensive. The natives derive great advantage from this reef in the way of food. Between Waikiki and Honolulu there is a vast collection of salt ponds for the production of salt.

**Honolulu.**—A general description of Honolulu as the capital of the Hawaiian kingdom has been given on p. 32, it remains to describe it as a port. It is a regular

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\* DOUGLAS brought up here in January, 1789:—he "ran in and dropped the stream anchor in 11 fathoms water, over sand and shells, at the distance of about 3 miles from a village, and 2 miles from a high bluff land on the eastern side of the bay;—the two extreme points which form this bay, bearing from W.  $\frac{1}{4}$  N. to E.S.E. It is called by the natives *Witootoo*, and the only good anchorage appears to be on the eastern side: while the Trade-wind blows a vessel may ride in safety; but if the wind varies to the S.E. or West, it then becomes dangerous on account of the number of shoals and banks which it contains."

resort of the Pacific whalers, who go there to refit and replenish stores; these number from 150 to 250 annually; in 1867, the other vessels entering were,—9 men-of-war, and 109 merchantmen—of which 54 were American, 24 British, 29 Hawaiian, and 2 under other flags. In the fall season it is nothing unusual to see 100 whaling ships in port at a time; but in the summer months the harbour appears quite deserted.

There is an outer road or anchorage, and a capacious harbour in which the depth is sufficient for the largest vessels; the channel through the coral reef leading to the harbour is also deep and of a good width, but at the entrance there is an inconvenient bar; however, when the American Pacific Steamship Company, in 1866, proposed to run a line of steamers monthly between San Francisco and Yokohama, they sent an agent to Honolulu, on whose representations the Government deepened the harbour and considerably extended the wharf, so that vessels of large size might coal alongside it; the water on the bar was also deepened, and additional buoys laid down to mark the channel. The British Consul, writing in 1867, says the wharf is excellent, "but the steamers ought not to draw over 18 or 19 feet water, although there is a depth of 21 feet on the bar."

*Outer Anchorage.*—Just outside the reef, and at a short distance to the eastward of the entrance to the harbour, there is a space where vessels may anchor in from 16 to 20 fathoms; but the holding ground is indifferent, consisting of hard sand and coral, and the surface very uneven. A conspicuous *bell buoy* in 16 fathoms now marks this anchorage.\* Though vessels may bring up safely here in summer, from March to October, the period when the N.E. trade-wind is steady, they must avoid doing so in the winter months, when the winds are irregular and southerly gales (sending in a heavy swell) are not uncommon: these southerly gales generally give good warning of their approach, for the swell often precedes the breeze by twelve hours, or a day; vessels anchored in the roadstead should, on this warning, either go to sea directly, or run into the port.

*The Harbour.*—The passage through the reef into the harbour, though well buoyed on both sides, is dangerous and should not be attempted, even if the wind be fair, without a thorough knowledge of the port. The morning is the best time to enter, as there is then a leading wind through the channel; after the Trade-wind has set in it cannot be entered. From the outer anchorage run along shore in nothing less than 11 fathoms, and the present leading marks over the bar are the northernmost black buoy (the third from the entrance on the starboard side of the channel) in line with the southernmost red buoy;† when over the bar, stand on in the line of

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\* In 1837 Capt. BRECHER gave the following marks for the outer anchorage in 16 fathoms;—the Punchbowl bearing N.N.E.  $\frac{1}{2}$  E., and the highest part of Diamond point E. by S.  $\frac{1}{4}$  S. Capt. TROLLOPE, in 1853, gave Punchbowl flagstaff N. 24° E., Fairway buoy N. 34° W., low point of Diamond point S. 72° E. Capt. HAREY, in 1856, gave Punchbowl N.E. by E., and the peak of Diamond head E. by S.;—but there is not a great deal of choice.

† *Notice—HARBOUR OF HONOLULU—Buoys.*—The western side of the passage to the harbour has been buoyed by the harbour-master, so that schooners beating-in may avoid grounding, as has often been the case of late. A bell has been placed at the anchorage upon a decked launch, so that coasters or our San Francisco packets may anchor with little trouble on the darkest night. (1865.)

buoys,—the depth in the channel being from  $5\frac{1}{2}$  to 6 fathoms. There is always a heavy swell on the bar with southerly winds—making it dangerous. Any one unused to the port should always take a pilot. The harbour affords accommodation for as many as two hundred vessels at a time.\*

Much of the coral banks is exposed at low water.

In consequence of the sea that rolls over the reef, and breaks in 4 or 5 fathoms water, boats must follow the same channel as large ships, or in all probability they will be run on the reefs, or be upset.

There are several *pilots* always ready to conduct vessels into and out of the harbour; and there are also *steam-tugs* for towage.

Custom-house charges are very moderate,—merely nominal; and no tonnage dues are levied on vessels. The wharf accommodation is extensive.

*Light*.—It is proposed to establish a light on the south-eastern side of the entrance of the harbour,—in about lat.  $21^{\circ} 17\frac{1}{4}'$  N., long.  $157^{\circ} 51\frac{1}{4}'$  W.

*Tides*.—It is high water at F. and C. at 4h.; the rise and fall being 2 feet at springs, and 1ft. to 1ft. 6in. at neaps; but the tides here are much affected by the winds,—gales (whether from north or south) bringing high tides, and a rise of 3 feet. Sometimes the rise is remarkably low, and without any apparent cause; it has been as little as 6 inches.

*Supplies* of every kind may be obtained here; and excellent water is carried down from Nuuanu valley, in iron pipes, to supply the city and the shipping. The consular report of 1867 says—"excellent coal from Vancouver's island can be laid down here at about 11 dollars, or 44s. per ton; Sydney coal at the same price; and Welsh steam coal at about 14 dollars or 56s. per ton.

**Harbour Regulations.**—These regulations appertain to all the ports of the Hawaiian islands; the following were issued in 1859:—

All letters under the care of the captain, or within his power, except such as are directed to the owner or consignee of the vessel, must be delivered to the postmaster at the port, before entry can be made or report received.

**OF MERCHANTMEN.**—The commanding officer of any merchant vessel, immediately after her arrival at either of the legalized ports of entry, shall make known to the collector of customs the business upon which said vessel has come to this port, and furnish him with a list of her passengers, before allowing baggage to be landed; and deliver him, under oath, a full, true, and perfect manifest of the cargo with which said vessel is laden, before allowing any parcels to be landed except the mail bags, delivered to order of the postmaster; which manifest shall contain an account of the packages, with their marks, number, contents, and quantities; also the names of the importers or consignees and shippers.

When any such officer shall fail to perform any or all of the acts above mentioned,

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\* A Hawaiian paper, speaking of the proposed improvements at Honolulu, says that the depth alongside the wharf was to be uniformly 24 feet; "the bar at low water has 21 feet, and at full tide 23 to 24 feet;" . . . "but it is understood that efforts will be made to deepen the channel." In 1866 Capt. HARVEY of H.M.S. *Hecate* estimated that "to deepen the bar to 5 fathoms, a space of about 700 square feet would have to be cleared out, varying in depth from 7 to 11 feet sand and coral."

within forty-eight hours after his arrival, he shall be subject to a fine not exceeding one thousand dollars.

He shall also, within the time above mentioned, deliver under oath a list of all stores on board at the time of his arrival, under penalty of forfeiture, and a fine of one hundred dollars.

**OF WHALEMEN.**—Masters of whaling vessels shall enter their vessels at the collector's office within forty-eight hours after their arrival at either of the ports of entry, and previous to discharging or shipping any seamen, or taking off any supplies or stores, under penalty of not less than ten, or more than one hundred dollars.

They shall also, within the time above stated, furnish a list of all wines and spirits on board as stores, and a manifest of all cargo and freight, except the produce of their fishery and the outfit, provisions and furniture of their vessel, under the penalty of forfeiting all such stores, cargo, and freight as are not on the list of stores or manifest, and a fine of one hundred dollars.

**OF PASSENGERS.**—Before landing baggage, a permit for the same must be obtained from the collector, and no permit can be granted until the requisite passenger list has been furnished by the captain.

Office hours at the custom house and other public offices, every day (except Sundays and national holidays), from 9 o'clock A.M. until 4 o'clock P.M.

**PORT REGULATIONS:**—The Harbour Master of Honolulu, and also of Hilo, shall be entitled to collect and receive from every vessel, except vessels engaged in the coasting trade, boarded by him, or to which he renders assistance or service, the sum of 3 dollars, in addition to his disbursements for the use of boats and warps, and for labour in mooring or making fast such vessels; and if necessarily detained on board more than two hours at any one time, he shall be paid at the rate of 1 dollar per hour for such extra detention; and for each time that he may be called upon to board, or that it may be necessary for him to board any such vessel, after having once moored her properly, he shall be entitled to receive the same pay as in the first instance.

The compensation of the Pilots shall be as follows:—1 dollar per foot upon the vessel's draught, coming into port, and the same going out of port. For anchoring any vessel off the port of Honolulu, provided the pilot be not detained on board longer than 24 hours, 10 dollars; and if detained longer than 24 hours, 5 dollars per day for such detention.

If any foreign vessel, or Hawaiian vessel engaged in foreign trade, shall enter or depart from any of the ports for which pilots may be appointed, without a pilot, such vessel shall be liable to one half pilotage.

All vessels that may enter any port shall be anchored in the place designated by the Harbour Master, and moved from one anchorage to another as he may direct; and no vessel, excepting coasting vessels under 50 tons burden, and vessels about to leave the harbour, shall quit her anchorage or moorings until the commanding officer shall have received the written permission of the Harbour Master, under penalty of a fine not exceeding 100 dollars.

The Harbour Master, or any Pilot, while removing a vessel from one anchorage or mooring to another, may make fast to any other vessel, or to any warp or wharf; and any person resisting the same, cutting away, or casting off the warp or fastening, shall be subject to a fine not exceeding 100 dollars; and if such person belong to

any vessel, the Master of such vessel shall be responsible for any damages resulting from such resistance, cutting away, or casting off, as well as the fine imposed upon the offender.

No combustible materials, such as pitch, tar, resin, or oil, shall be heated on board of any vessel within the harbour of Honolulu; but all such combustible articles shall be heated either on shore, or in a boat, or on a raft, at a reasonable distance from the vessel, of which distance the Harbour Master shall be judge. Every person violating the provisions of this section, shall be liable to a fine not exceeding 100 dollars.

No stones or other rubbish shall be thrown from any vessel in the harbour of Honolulu, or Hilo, under penalty of a fine not exceeding 100 dollars, and the master of any vessel from which stones or rubbish are thrown, shall be subject to a like fine.

Any person who shall throw, or cause to be thrown, or leave, or cause to be left, for the space of 6 hours, upon the shores or reefs of any harbour in the Hawaiian kingdom, any dead animal, shall be subject to a fine not exceeding 100 dollars, and shall cause the same to be removed without delay.

Every vessel taking on board, or discharging any ballast, or coals, within the harbour of Honolulu, shall have a tarpaulin properly stretched and spread so as to prevent any from falling into the water, under penalty of a fine not exceeding 100 dollars.

**PORT DUES:**—Besides the above charges, there are the following. Health certificate, 1 dollar. When vessels anchor in the harbour, 20 cents a ton register; buoys, 2 dollars; clearance, 1 dollar. When vessels anchor outside the harbour, and land, tranship, or take on board any cargo, landing or taking on board more than two passengers, 5 cents per ton register. When vessels touch at the port for refreshment only, and neither landing nor receiving any cargo, taking nor leaving more than 2 passengers, they shall pay but 10 cents per ton register; but if they discharge or take cargo, leave or take more than 2 passengers, they shall pay 20 cents per ton register. The manifest, entry, and permit stamps cost but 4 or 5 dollars.

*Ballast* can be obtained at about 5 dollars per ton, delivered on the wharf.

*Wharfage*:—Vessels at the government wharfs are charged 2 cents a ton per day; wharfage for merchandise shipped or landed from vessels lying in the stream, 25 cents a ton.

*Steam-tugs* charge for towage from 45 to 75 dollars, according to size of vessel.

Capt. T. HARVEY of H.M.S. *Havana* made the peak *right* of Nuuanu valley, 3129 feet high; peak *left* of Nuuanu valley, 2748 feet; Kariki peak (more to the left) 2752 feet.

**MAKING OAHU:**—From the coast of Central America it is always best to push south and S.W. until getting the S.E. trade. Sailing on with this, in from 2° to 5° N. as far as 115° to 125° W., making nothing according to the time of the year; in summer the latter longitude is preferable, and then cross the variables for the N.E. trade. By this route the miserable weather of the central coast is avoided. H.M.S.-ship *Swift* followed this plan and made the passage from Panama to Honolulu in 47 days; but in 1848 H.M.S. *Herald*, although towed from Panama 1000 miles, took 42 days to get clear of the *doldrums*, through keeping in lat. 9° to 10° N.

Making these islands bound to Honolulu, it is better at all times of the year to *keep clear of Hawaii*, and to make Maui from the northward.

**Pearl Loch or Pearl River Harbour**, in the district of Ewa, is a large inlet of the sea, into which the river Ewa empties, and it has the appearance of a lagoon that has been partially filled-up by alluvial deposits. It derives its name from the circumstance of the pearl-oyster being found here,—the only place in these islands where it occurs. The entrance to the inlet is 5 miles west (southerly) from the entrance to Honolulu harbour, and about 8 miles eastward of the S.W. point of Oahu. As at Honolulu, the channel leading to the loch or harbour is good when the bar has been crossed. When WILKES surveyed it (1840), the depth at the mouth was 15 feet, but “after passing this coral bar which is 400 feet wide, the depth of water becomes ample for large ships, and the basin is sufficiently extensive to accommodate any number of vessels.” In 1857 Capt. HAREY, H.M.S. *Havana*, spent a whole day sounding on the bar without obtaining any satisfactory result; he says, “the channel has only 12 feet water, is intricate, and requires a skilful pilot to take the smallest vessel through it: the harbour is very extensive, with sufficient water for any ship, 6 and 7 fathoms being found alongside small cliffs not more than from 10 to 12 feet above the level of the sea, the land behind them being flat.” It is considered practicable to open a deep channel into this magnificent sheet of water, when the extensive and rapidly increasing traffic of the ports on the west coast of America with China, India, and Australia requires it; if this is effected, it will afford the best and most capacious harbour in the Pacific; at present the port of Honolulu is sufficient for the trade.

The shore between the channel leading to Honolulu and that leading to the Pearl loch is fronted by a coral bank that dries at low water for the distance of  $\frac{2}{3}$  of a mile to  $1\frac{1}{2}$  miles, and the line of “constant breakers” extends fully  $\frac{1}{2}$  a mile further seaward,—and more in bad weather. Eastward of the entrance to the Pearl loch channel the coral bank is also extensive; the line of breakers, however, is still upwards of a mile off shore, decreasing towards Barber point; it is known that there are two or three outlying patches of coral near the outermost breaker-line, and it is possible there may be more.\*

The harbour abounds in fine fish, and there are several flourishing villages on its shores. The extensive Puuloa saltworks are at Ewa; the salt is very abundant and

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\* The entrance to the loch was examined by VANCOUVER in March, 1793. “The opening in the reef, about 400 yards wide, was found to be occupied by a sandy bar about 200 yards across, on which there was not more than 9 or 10 feet water; but on each side of it the water suddenly increased in depth to 5 and soon to 10 fathoms. These soundings were regular on each side of the bar; on the inside the bottom is a stiff mud or clay; this, with the same soundings, continued to the entrance of a small harbour about  $\frac{1}{2}$  a mile within the bar, formed by two low sandy points, about the same distance asunder. From each of these sandy points extended a shallow flat, near a cable’s length on either side, contracting the width of the deep-water channel to not more than a  $\frac{1}{2}$  of a mile; in this is 10 fathoms water; but the entrance is again further contracted by a sunken rock, stretching nearly into mid-channel from the northern shore, with which it is connected; on this was found only 2 feet water, although the depth is 10 fathoms within a few yards of it. From the entrance, this little harbour about a  $\frac{1}{2}$  of a mile wide, took a N.W.-ly direction for about a mile; the depth from 10 to 15 fathoms, muddy bottom; it then seemed to spread out, and to terminate in two bays, about a mile further to the northward, forming a very snug and convenient little port; unfortunately the bar without renders it fit only for the reception of very small craft.”

of good quality; of late years it has become one of the staple articles of Hawaiian export.

**The West side of Oahu**—from Waimanalo or Barber point to cape Kaena—trends N. 25° W. about 19 miles. It is principally composed of steep craggy mountains, some descending abruptly to the sea, others terminating at a small distance from it, whence a low border of land extends to the sea-shore, formed by sandy beaches, chiefly bounded by rocks, over which the surf breaks with great violence. Not far from the S.W. (or Waimanalo) point is a small grove of cocoa-nut trees, and along the shores are a few straggling huts. Nearly in the middle of this side of the island is a village. In its neighbourhood the bases of the mountains retire further from the sea-shore, and a narrow valley, presenting a fertile, cultivated aspect, seemed to separate, and wind some distance through, the hills. The shore here forms a small sandy bay (**MALIAKA** bay). On its southern side, between the two high rocky precipices, in a grove of cocoa-nut and other trees, is situated the village, and in the centre of the bay, about a mile to the north of the village, is a high rock, remarkable for its projecting from a sandy beach: at a distance it appears to be detached from the land. Between this and the high rocky point to the southward of the village, is a bank of soundings that stretches some distance into the sea. On the south side of this bank the soundings were irregular, from 25 to 8 fathoms, rocky bottom; but to the north of it, near the rock, no ground could be reached with 90 and 100 fathoms of line, though not more than  $\frac{1}{4}$  of a mile from the shore;\* this we found to be the case also a little to the southward of the bank. In both these places we were for some time very awkwardly situated, without wind, yet with a swell and current that set us so fast towards the land, that I was under some apprehension for the safety of the ship, as the united force of the current and swell prevented any effect from the assistance of boats; from this dilemma however we were happily relieved by a breeze springing up. . . . We were earnestly entreated by the natives to anchor, but the situation was exposed, and the extent of anchorage was not only very limited, but bad." (**VANCOUVER**, March, 1793.)

The village of **Waianae** lies on the sea-shore on the S.W. side of the Kaala mountains. It is distant from Ewa 16 miles by a road through a gap in the mountain. Mauna Kaala has the appearance of being a flat topped mountain; but this is not the case, the evenness of the ridge alone giving it that appearance.

**Cape Kaena** in lat. 21° 34' N., long. 158° 16' W., is the west point of Oahu; thence the coast trends irregularly to the N.E.-ward for the distance of 17 miles to **Kahuku** (or **Punalan**) point in lat. 21° 43½' N., long. 158° W.; on this side of Oahu there are a few open bays for vessels not exceeding 150 tons; the best of these is **Kawailoa**, then follow in succession to the north-eastward **Waimea**, **Haula**, **Kakaua**, **Moluilui**, and **Makua**.

**Kawailoa** forms a small bay, and has a dreary aspect on first landing. The soil is sandy and poor near the coast, but at a short distance inland an agreeable change is met with in extensive *taro*-patches, fish-ponds, and fine fields of sugar-cane. It

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\* On the chart this is called **Waianae** point.

was near this place that GOOCH (the astronomer to VANCOUVER's expedition) and Lieut. HENGEY were killed by the natives in Dec. 1792.

**Waimea bay.**—The *Resolution* and *Discovery*, after COOK's death, were brought up here in February, 1779. KING says,—“between the North point of the island and a distant headland to the S.W. the land bends in considerably; we directed our course along the shore, at the distance of about a mile, carrying regular soundings from 20 to 13 fathoms. Seeing a fine river running through a deep valley, induced us to come to an anchor in 13 fathoms water, sandy bottom; the extreme points of the bay bearing S.W. by W.  $\frac{1}{2}$  W. and N.E. by E.  $\frac{3}{4}$  E., and the mouth of the river S.E.  $\frac{1}{2}$  E. 1 mile distant. The water had a brackish taste for 200 yards up the river, owing to the marshy ground through which it empties itself into the sea; beyond this it was perfectly fresh, and formed a fine running stream, along the side of which I walked till I came to the conflux of two small rivulets that branched off to the right and left of a remarkably steep and romantic mountain.” This side of the island KING describes as well cultivated and full of villages,—and the face of the country uncommonly beautiful and picturesque. In the bight of the bay to the south of the anchoring place, there is rocky foul ground 2 miles from the shore; and there is no landing on the coast to leeward, on account of a reef of coral which stretches along the shore to the distance of  $\frac{1}{2}$  a mile.

The North point of the island, which is low and flat, has a reef stretching off it to the distance of  $1\frac{1}{2}$  miles or perhaps more, thence it trends along the coast some miles to the S.W.-ward and S.E.-ward, to what distance is uncertain.

The W.E. side of the island when viewed from seaward appears to be formed of detached hills rising perpendicularly from the sea, with ragged and broken summits; the sides are covered with wood, and the valleys between them fertile and well cultivated. Kaneohe, in the district of Kulau, is the principal place on this side of the island. The harbour opposite to it, and which is formed by the peninsula of Mokapu, about 10 or 11 miles from the east extreme of Oahu, is called *Waialae*, and was surveyed by WILKES (1840). At its entrance it was found to have only 9 feet of water, a depth too little except for the smaller vessels of the island.

**KAWAI** (ATOUI of COOK; ATOUI of PORTLOCK; and ATTOWAI of VANCOUVER).—This island, distant from cape Kaena (the west point of Oahu) 64 miles, lies between lat.  $21^{\circ} 52'$  and  $22^{\circ} 15' N.$ , and between long.  $159^{\circ} 16'$  and  $159^{\circ} 47' W.$ ; it is 28 miles long in an east and west direction, and 22 miles wide; and like the rest of the group of volcanic formation. It was the first of the Sandwich islands visited by COOK in 1778, and KING, speaking of it after having seen the others, says,—“the face of the country to the N.E. and N.W. is broken and rugged, but to the south it is more even; the hills rise with a gentle slope from the sea-side, and, at some distance back, are covered with wood. Its productions are the same with those of the other islands; but the inhabitants far surpass all the neighbouring islanders in the management of their plantations. In the low grounds, adjoining to the bay (Wymoe) where we lay at anchor, these plantations were divided by deep and regular ditches; the fences were made with a neatness approaching to elegance, and the roads

through them were thrown up and finished in a manner that would have done credit to any European engineer."

Kauai is divided into six districts, viz., Kulau and Halelea on the north, Napali on the N.W., Mana on the S.W., Kona on the south, and Puna on the east; it is watered by several good streams; and besides the two principal anchorages—Hanalei bay on the north and Waimea bay on the south side—there are two or three others of minor importance—more exposed and only fit for small vessels. The highest point of the island, estimated at 6000 feet, is called Wailoli, and is supposed to have a crater on its summit, like many of the other high mountains of the group; it is said that, when the weather is clear, the natives ascend this mountain for the purpose of getting a view of Oahu, nearly a hundred miles distant. Kauai is considered one of the pleasantest of the islands, and the difference of latitude between Kauai and the southern part of Hawaii is enough to make a perceptible difference in climate. The shape of the island also, allowing one (as at Lihue and Wailua) frequently to take in a wide stretch of landscape without having his view bounded by the sea—allowing him to feel as if he were in a "great country"—makes the scenery, which is very beautiful in itself, much admired by those whose insulated vision has perhaps for years ranged only over the narrow strip of land between the Honolulu hills and harbour. The eye which for a long time has found every view bounded by the ocean (as is necessarily the case on most of the islands), making the observer aware of his insulated, almost imprisoned, life, finds great relief in a view which allows it to strain itself to see further into land stretching beyond its bounds, without finally resting on the white spray of the breakers. Consequently, the beauties of Kauai—Hanalei valley, Hanapepe waterfall, Koloa spouting-rock (there are many others on the islands), the Mana singing-sands, &c.,—have been written about and frequently extolled.

The tract of arable land on Kauai adapted to grazing or planting stretches from Hanalei to Hanapepe valley. Portions of this island appear better adapted to agriculture than the other islands. There are coffee and sugar plantations at Hanalei, Nawiliwili, and Koloa. This portion of the island is well watered with frequent rains and streams. The Waimea district, being the lee of the island, is dry and adapted to cultivation only in the valleys. That part of the island stretching from Mana point round the western side to Hanalei is rocky, dry, barren, and uninhabited. On all the low wet grounds are *taro* patches and fish-ponds; and wood is abundant.

The same remark may be made of all the islands as of Kauai, that the want of capital, with an industrious population, is the only thing needed to develop resources now lying almost wholly idle.

In form Kauai is rudely ovate. VANCOUVER says that the N.E. end is a rounded point projecting into the ocean from a very remarkable forked hill, that is in a great measure detached from the rest of the connected mountains of the island. About 9 miles to the south of this is another low point extending from a range of low hills that stretch along the coast, at a small distance within the beach. About a league to the southward of the latter is the S.E. point, which is a bold, bluff, barren, high, rocky headland falling perpendicularly into the sea. Between this and the low point *last mentioned* is a small cove, accessible for boats only, where, near a rivulet that *flows into it*, is the fishing village of ~~Nawiliwili~~ or Puna. A few miles further

north is the village of *Waimua* or *Waima* (once a place of some importance) situated on a small stream of the same name; though the immediate vicinity is sandy and barren, the low grounds along the river are extremely fertile; in other respects the whole of this side of the island is uninteresting, but it is well watered.

The most prominent point between *Wailua* and *Koloa* is called *Kauai*.

**Koloa.**—The S.E. bold, rocky point already referred to is called *Koloa*, and a little to the westward of it is a considerable village of the same name, off which there is anchorage for small vessels in a very exposed position, with a heavy sea frequently rolling in; there is good landing, however, in a small rocky cove that appears as though it had once been a large cavern the top of which has fallen in. Near the beach are two old craters. The face of the country around *Koloa* is much broken into hills and extinguished craters, but the land is generally fertile, and receives a sufficient quantity of rain; in the immediate vicinity of the village the soil is stony and dry, but being good, is well cultivated.

The South and S.W. sides of the island between *Koloa* and *Waimea* seem to be a series of sunburnt hills and barren plains, sloping gradually from the base of the mountains to the ocean, and now and then intersected with "gulches" or ravines. A few miles to the westward of *Koloa*, and about 6 miles to the S.E.-ward of *Waimea* is the celebrated valley of *Hanapepe*, which has apparently been formed by volcanic action. At its entrance it is about half a mile wide, and decreases in width as it approaches the mountains. At its head is a waterfall, and although the volume of water is not great, yet the form and situation of the cascade amidst a mass of columnar rocks, here and there thickly overspread with a luxuriant vegetation, add very much to its beauty; the water falls into a quiet basin beneath, and the spray being driven by the wind upon each bank, affords nourishment to a great variety of ferns; at its foot it forms a small river, that passes down through the centre of the valley. This whole scene is very striking, the banks forming a kind of amphitheatre rich in foliage, and with rills of water coursing down them in every direction.

The coast must now be approached with great caution, because opposite *Kona* peak on the west side of the entrance to *Hanapepe* valley a coral reef commences, and here stretches some distance seaward; thence it trends along the S.W. shores of the island as far as point *Mana* or *Kolo*,—the westernmost point of *Kauai*.\*

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\* *Cook* (January, 1778), seeing no signs of an anchoring-place at the eastern extreme of *Kauai*, bore away to leeward and ranged along the S.E. side, at the distance of half a league. "We passed several villages; some seated near the sea, and others farther up the country; . . . the land on this side of the island rises, in a gentle slope, from the sea to the foot of the mountains which occupy the centre of the country, except at one place near the east end, where they rise directly from the sea, and seemed to be formed of nothing but stone, or rocks lying in horizontal strata. . . . We continued to sound, without striking ground, with a line of 50 fathoms till we came abreast of a low point, which is about the middle of this side of the island; here we met with 19 and 14 fathoms, over a rocky bottom. Being past this point, from which the coast trended more northerly, we had 20, then 18, 12, and, at last 5 fathoms, over a sandy bottom; the last soundings were about a mile from the shore." Night coming on the vessels then stood off and on till the next morning, when *Cook* made for *Wymoa* bay and "anchored in 25 fathoms water,

**Waimea bay (WYMOA of COOK—WHYMRA of VANCOUVER):**—This bay lies about midway between Koloa and Mana points, and a mile to the west of the village is the spot where the first English boat landed from COOK's expedition on the discovery of the Sandwich islands. "The road or anchoring place which we occupied is on the S.W. side of the island, about 6 miles from the west end, before a village which has the name of Wymoa. As far as we sounded, we found that the bank has a fine grey sand at the bottom, and is free from rocks, except a little to the eastward of the village where there spits out a shoal, on which are some rocks and breakers; but they are not far from the shore. This road would be entirely sheltered from the trade-wind if the height of the land over which it blows did not alter its direction, and make it follow that of the coast; so that it blows at N.E. on one side of the island, and at E.S.E. or S.E. on the other, falling obliquely upon the shore. Thus the road, though situated on the lee side of the island, is a little exposed to the Trade-wind; but, notwithstanding this defect, is far from being a bad station, and much superior to those which necessity obliges ships daily to use, in regions where the winds are both more variable and more boisterous." (COOK, Jan. 1778.) The vessels brought up here again, in 1779, after COOK's death; the anchorage was "in 26 fathoms water, the bluff head on the west side of the village bearing N.E.  $\frac{1}{2}$  E. 2 miles distant; the extremes of the island N.W. by W.  $\frac{1}{4}$  W. and S.E. by E.  $\frac{1}{4}$  E.; the island Oneeheow W.  $\frac{1}{2}$  S. In running down to the road, from the S.E. point of the island, we saw the appearance of shoal water, in several places, at a considerable distance from the land; and when we were about 2 miles to the eastward of the anchoring place, and 2 or 3 miles from the shore, we got into  $4\frac{1}{2}$  fathoms water, although our soundings had usually been 7 and 8 fathoms." (KING.)

VANCOUVER brought up here in March, 1792, in 24 fathoms water, with a bottom of dark grey sand and mud. The east point of the bay bearing, by compass, S. 67° E.; the west point N. 70° W.; and the river N. 31° E., about 2 miles distant. Again, in 1794, when reviewing his position here, he says;—"by our several visits to Kauai, we had found that the roadstead was much confined in respect to safe anchorage; for although the *Discovery's* cables had not been much injured by a foul bottom, yet the *Chatham*, in March, 1792, when anchored in 30 fathoms water at only a convenient distance to the northwestward of the *Discovery*, on a bottom of soft mud, had both her cables much fretted and damaged by the rocks at the bottom; and not far from the eastward of our easternmost anchor was found also a patch of rocky bottom, in some places not deeper than 4 fathoms, though surrounded by a depth of from 30 to 40 fathoms. Although a situation more convenient to the shore, in a less depth of water and with a muddy bottom, might have been taken within the *Discovery's* station, and is to be found by keeping the steep banks of the river not shut in, but just a little open; yet, from the lurking patches of rocks that have

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the bottom a fine grey sand. The east point of the road, which was the low point before mentioned, bore S. 51° E.; the west point N. 66° W.; and the village, behind which the water was said to be, N.E. by E. distant 1 mile. But, little more than  $\frac{1}{4}$  of a mile from us, there were breakers, which I did not see till after the *Resolution* was placed; the *Discovery* anchored to the eastward of us, and farther from the land." (COOK, 1778.)

been found near the same sort of bottom, it is evident that great caution should be observed to avoid those hidden dangers."\*

The surf breaks high against the shore with southerly winds, preventing all communication by boats; and the same remark applies to the whole of that part of the coast between Waimea and the west point of the island.

Waimea, according to WILKES, offers the best anchorage at the island, except in the months of January or February, when the Trade-winds are interrupted, and the wind blows strong from the S.W., and directly on shore. The village takes its name from the river, which rises in the mountains, and after a course of about 15 miles, enters the sea there; it is navigable for boats  $\frac{1}{2}$  of a mile from its mouth.

The sandy plain that skirts the S.W. side of the island is from a fourth of a mile to a mile wide, and is 150 feet above the level of the sea; the ground rises thence gradually to the summit of the mountains. On the low grounds the cocoa-nut tree thrives and bears abundant fruit. The sea along this coast abounds in fish.

**Point Mauna or Kolo**—the west point of Kauai island—is in lat.  $22^{\circ} 7' N.$ , long.  $159^{\circ} 46' W.$  (approximate); the reef already spoken of reaches beyond the point, besides which there are some outlying rocks; the coast is open and exposed; and a very heavy surf rolls on the beaches; there is no harbour in its vicinity.

The N.W. coast of the island, forming the district of Na-pali, has a very rugged and romantic appearance, rising suddenly to lofty abrupt cliffs that jut out into a variety of steep, rocky points, destitute of both soil and verdure, but terminating nearly in uniform even summits, on which, as well as in the valleys or chasms that are formed between them, are small patches of green. Here and there a stream, running from the lofty mountains behind, finds its way to the ocean. This character of coast continues to Hanalei bay.

**Hanalei bay**, in the district of Halelea, on the north side of Kauai, was surveyed by Sir E. BELCHER in 1838; it lies between two conspicuous bluff heads which cannot be mistaken, and is about a mile wide at the entrance, and  $\frac{1}{2}$  of a mile deep, but the whole of this area is not anchorage ground,—the shores being fringed with a reef which, on the east side (opposite the mouth of the river, and the bluff northward of it), sends out a spit with detached heads to the distance of 3 cables from the beach, in some places.

**Anchorage** :—Entering about midway between the heads, and not borrowing too

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\* PORTLOCK, in Dec., 1786, anchored here in 85 fathoms, over a bottom of fine black and grey sand, to the eastward of Waimea; the town and river bearing N. by W.; the east point of the bay E. by S.  $\frac{1}{2}$  S.; the west point N.W. by W.  $\frac{1}{2}$  W.; and the distance from the nearest shore about 2 miles. He observes,—“as I knew the bank to be very steep, and the wind blowing fresh, I was afraid our anchor would start off; to prevent which we wore away to a cable and a half, and then the ship lay in 48 fathoms water, over the same bottom; one cable’s length astern there was 100 fathoms. . . . Soon afterwards the *Queen Charlotte* let go her anchor a little within the *King George*, but by checking the cable too soon, she dragged it off the bank and could not get it to catch again with a whole cable out; therefore got her head off shore, hove their anchor up, and made sail; but finding they could not get up to us before night came on, they stretched well in, and anchored about  $1\frac{1}{2}$  miles to the westward of Waimea and a fresh water river, and opposite a large grove of cocoa-nut trees near the west point of the bay.”

much towards the east side until past the spit off the mouth of the river, the anchorage is in 6 to 7 fathoms water at 3 cables' distance S.W.  $\frac{1}{2}$  S. from the bar of the river, and the same distance from the nearest shore. "In this position the anchorage is pretty well covered by the spit,—over which there is about 9 feet (or less in places); but there is not sufficient space in bad weather for more than three vessels, although in the fine season the bay is spacious." (BELCHER.) It is completely exposed to all winds from the N.W.-ward,—gales from which quarter must send in a very heavy sea; but some vessels have ridden out the season in spite of everything.\*

"The *landing* is within the mouth of a small river, which carries, for a considerable distance up, from 1 to  $\frac{1}{2}$  of a fathom, into fresh water, and is further navigable for boats or canoes (drawing 3 feet) several miles." (BELCHER.) It has but little current, and is slightly affected by the tide near its mouth. Boats cross the bar at half flood.

*Supplies*, animal and vegetable, are of the finest quality; water can be filled in the boats, by sending them into the river.

A farm situated on a hill on the north side of the river is in lat.  $22^{\circ} 14' N.$ , long.  $159^{\circ} 32' W.$ ;—or  $1^{\circ} 38' 12.5'' W.$  of Honolulu, according to Sir E. BELCHER, which, taking Honolulu to be in  $157^{\circ} 51' W.$ , places Hanalei bay in long.  $159^{\circ} 29' W.$

The village or town of Hanalei is at the bottom of the bay, and the scenery is beautiful. The climate, as to temperature, is cooler than the other side of the island; and the rains are so frequent as to clothe the country in perpetual green. It rains nearly nine months in the year, and Halelea—"land or place of rainbows"—derives its name from the numerous rainbows formed by these passing showers.

Though Waimea is the safest anchorage, Hanalei is very frequently visited; and although much exposed to the winds, it has more pretension to the name of a harbour than any other place on the island.

**N.E. part of Kauai.**—To the eastward of Hanalei is Waioli: the fertile plain on which it is situated is only 6 or 8 feet above the level of the sea, and lies between the Halelea and Waioli rivers.

On the N.E. side of the island are situated the small villages of Kupaa, Kealia, Anahola, Mowaa and Kauharaki, near the mouths of mountain streams which are closed by sand-bars. The streams above the bars are in most cases deep, wide, and navigable a few miles for canoes.

The rivers, as well as sea, abound in excellent fish, and afford a plentiful harvest to the fisherman.

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\* VANCOUVER, when coasting along the north side of Kauai, in March, 1794, saw this bay;—he says,—“at sunset a small islet lying near the shore, and situated from the N.E. point of the island,  $6\frac{1}{2}$  miles distant, bore by compass S.  $38^{\circ} W.$  2 miles from us; and the shores of the island, which are alternately cliffs and beaches, bore from S.  $50^{\circ} E.$  to S.  $71^{\circ} W.$ ; . . . about 8 A.M. we were off a small deep bay; its east point lies from the above islet west, distant 4 miles; this bay is nearly half a league wide, and about the same depth; but being exposed to the violence of the N.W.-ly winds, and the oceanic swell, is ineligible for shipping, and therefore we did not examine it; but continued our route with a fine breeze from N.E., at the distance of about 2 miles from the shore, passing some rocks and breakers that extend a small distance from the west point of the bay.”

**NIIHAU** (ONEEHOW of COOK) lies to the S.W.-ward of Kauai, being separated from it by the Kaulauka channel, which is 16 miles wide,—but the S.W. side of Kauai being fringed with a coral reef and Oku point (in Niihau) having a shoal off it, neither must be approached too closely. The island is 17 miles long (north and south), and, owing to its very irregular outline, varies in width from  $2\frac{1}{2}$  to 9 miles; its area is about 80 square miles, and, in 1860, it contained a population of 647 persons.

A range of steep hills 800 (?) feet high extend from north to south, nearly skirting the eastern shore, so that the land on this side of the heights is very narrow, and the population sparse; but on the western side of the island there is a level plain of some 2 to 4 miles in width, on which are cultivated yams, sweet potatoes, melons, and fruit,—for which the island is famous. Fresh water can only be procured during the rainy season when the short and narrow watercourses are full; at any other season there is no water but what the natives have preserved in some cisterns of rock for their own use,—and these are chiefly near the south end of the island.

The eastern side of Niihau is rocky and wholly destitute of shelter or anchorage; but on the western side, in two or three small open bays or rather roadsteads, anchorage may be found, though much exposed.

COOK, in 1778, when abreast (or to the westward) of the south point found 30, 25, and 20 fathoms water, over a bottom of coral sand, a mile from the shore; further to leeward, he anchored in 26 fathoms water,  $\frac{2}{3}$  of a mile from the shore.\* On a subsequent occasion (1779) the vessels brought up again, near the same spot, in 20 fathoms,—mooring with the other anchor in 26 fathoms water;† during a strong gale from the eastward the ship drove a whole cable's length, and brought both anchors almost ahead, where they held. The master being sent to the N.W. side of the island to look for a more convenient place, found "close round the west point of the road where we lay, which is also the westernmost point of the island, a fine bay, with good anchorage in 18 fathoms water, a clear sandy bottom, not a mile from the beach, on which the surf beats, but not so as to hinder landing;‡ on the north side of the bay was a small village, and a  $\frac{1}{2}$  mile to the eastward, four small wells of good water."

VANCOUVER, in 1792, anchored in 14 fathoms water off the south part of the island, about  $\frac{2}{3}$  of a mile from the shore, bottom soft, sandy, regular and good;§ "I was induced to prefer this anchorage to a situation I had been in further to the N.N.W., as the surf broke with great violence on the N.W. side of the island, though here we rode very smoothly."

\* The S.E. point of the island bore S.  $66^{\circ}$  E., 3 miles; the other extreme N. by E., 2 miles; a peaked hill (inland) N.E.  $\frac{1}{2}$  E., and Kaula (Taboora) island S.  $61^{\circ}$  W.

† The south end of the island, E.S.E.; the north point of the road N.  $\frac{1}{2}$  E.; the bluff head to the south of it, N.E. by N.

‡ The direction of the points of the bay, N. by E. and S. by W.; and in that line the soundings were 7, 8 and 9 fathoms.

N.B.—The above positions are from COOK's Voyage, and the variation was  $8^{\circ}$  E.

§ The S.E. point of island bearing by compass S.  $77^{\circ}$  E.; the west point N.  $46^{\circ}$  W.; and Kaula (Taboora) island S.  $58^{\circ}$  W.

Again, in 1794 VANCOUVER anchored off the *west* side of Niihau in 18 fathoms water, soft sandy bottom;\* "here the *Chatham* (at anchor near us,) hooked a rock under water, and was with difficulty cleared; . . . although this station has been the general rendezvous for vessels, it is in all respects inferior to the place of our anchorage on the former visit,—the bottom here being at a greater depth, and very rocky, and the situation open, and exposed to all the violence of the North and N.W. winds, and the swell of the ocean. The other situation is protected from this inconvenience, with the additional advantages of a less depth of water, and a clear bottom of good holding ground.

**Yam bay.**—It was in the worst of the two anchorages described by VANCOUVER that BEECHY brought up in H.M. Ship *Blossom* in 1826; he says—"there is but one place in the bay where the boat can effect a landing with safety when the sea sets into the bay, which is a very common occurrence; this is on its northern shore, behind a small reef of rocks that lies a little way off the beach, and even here it is necessary to guard against sunken rocks; off the western point these breakers extend  $1\frac{1}{2}$  miles. The soundings in the bay are regular, upon a sandy bottom, and there is good anchorage (if required) with the wind from the eastward; but it would not be advisable to bring up under any other circumstances. This is Yam bay.

**Light.**—A lighthouse is in course of construction on cape Kawaihoa, the south point of Niihau,—in lat.  $21^{\circ} 45' N.$ , long.  $160^{\circ} 12' W.$  (approximate).

**LAHUA (OREEHOVA of COOK)**—about  $\frac{2}{3}$  of a mile off the N.W. extremity of Niihau—is a high and somewhat broken peak, apparently part of a crater, the S.W. side of which has fallen in, leaving the inner face exposed in that direction—a black and rugged precipice; it is probably not less than 500 feet high: the faces towards Kauai and Niihau are covered with scattered tufts of grass, among which numerous wild rabbits find a home. The most singular thing on the island is a small perennial spring of excellent fresh water, a few feet above high water mark.

The depth of the narrow channel between Lahua and Niihau has never been ascertained.

**KAULA—(TAHOORA of COOK):**—This island is in sight from Niihau, and is distant from its nearest point 18 miles in a S.W.  $\frac{1}{2}$  W. direction. It is a small, elevated, barren rock, wholly destitute of vegetation, but abounding in sea-fowl and their eggs, for which the natives occasionally visit it. A landing can be effected only in the calmest weather, as the surf breaks very heavily on the shore at all times. Approximate position of centre;—lat.  $21^{\circ} 38\frac{1}{2}' N.$ , long.  $160^{\circ} 32' W.$

**N.B.**—Many of the foregoing observations on the Hawaiian islands are derived from the voyages of our early navigators,—whose authority is still very high on the subject. Their remarks have been collated with the many scattered and disjointed observations made during later years; but it does seem strange that an archipelago

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\* The N.W. point of the island bearing by compass N.  $25^{\circ}$  E.,  $\frac{1}{2}$  a league distant; the nearest shore E.  $\frac{1}{2}$  E.  $1\frac{1}{2}$  miles; the west point S.  $15^{\circ}$  E.; Kaula (Tahoora) island S.  $43^{\circ}$  W.; and the outer part of the reef that extends from the N.W. point N.  $8^{\circ}$  E.

**N.B.**—The variation in VANCOUVER's time was about  $9^{\circ}$  E.

so frequently visited, should to this day have remained unsurveyed, and the positions of most of the places be only approximately known.

**NIHOA or Bird Island**—(MODOO-MAMOO of VANCOUVER)—was discovered by Douglas in March, 1789, and visited by VANCOUVER in March, 1794; "the uncouth form of its northern, eastern, and western extremities, against which the sea broke with great violence, presented a most awful appearance, rising perpendicularly from the ocean in lofty rugged cliffs, inaccessible but to its winged inhabitants; on its southern side the ascent is not so steep and abrupt; and near its western extremity is a small sandy beach, where in fine weather, and with a smooth sea, a landing might probably be effected. At this place there was the appearance of a little verdure, though it was destitute of tree or shrub; every other part was apparently without soil, and consisted only of the naked rock." (VANCOUVER.)

From observations taken to make a plan of it, by Capt. T. HARVEY, H.M.S. *Havana* (Dec. 1856), the island was found to be about  $\frac{1}{2}$  of a mile long, by  $\frac{1}{4}$  of a mile broad, and 880 feet high, the north side being a perfect precipice; but on the south side there is a little bay where landing has been made in the summer season. The master went as close as a boat could safely approach, and pulled along the island to observe the practicability of a footing being obtained in more moderate weather: he found within 600 yards there were soundings in 15 fathoms; could only see one spot—a large boulder beach of about 200 feet in extent—where it appeared possible in the finest weather to land. The men-of-war birds came round the boat in some numbers and were troublesome: no seals, sea-lions, or animals of any description were observed, nor any appearance of guano. From the formation of the rock and the large amount of heavy rain that falls in its vicinity, it is not possible that any quantity could accumulate;—nor were birds seen in such quantities as to warrant the expectation.

Lieut. BROOKE, of U.S. surveying schooner *Fenimore Cooper*, found it to be  $\frac{1}{2}$  a mile long (east and west), by  $\frac{1}{4}$  of a mile in width, with a peak at each extremity,—the eastern one of which was made out to be 534 feet high. This agrees with the description of DOUGLAS, who stated it to "bear the form of a saddle, high at each end."



*Bird Island, bearing E. by S. 1 mile dist.*

Capt. PATT of the *Manuokawai*, found landing practicable, although difficult, at a spur of sandy beach on the south side, where he also found a small drain of fresh

water; he saw a few seals and plenty of birds. There is anchorage from  $\frac{1}{2}$  of a mile to 2 miles off the south side, in from 7 to 17 fathoms water.

According to DOUGLAS and VANCOUVER, this island is in lat.  $23^{\circ} 6\frac{1}{2}'$  N., long.  $161^{\circ} 55'$  W. (corrected mean).—Lieut. BROOKE, U.S.N. (1859), made it in lat.  $23^{\circ} 5' 50''$  N., long.  $161^{\circ} 56' 30''$  W. See Note, p. 53.

**Papappa rock** :—On most charts a rock of this name, but marked "doubtful," is placed in lat.  $21^{\circ} 30'$  N., long.  $161^{\circ} 18'$  W.; in one case it is stated to be 200 feet high, and a "whaler's report." The origin of the report is probably as old as COOK's third voyage. On the discovery of the Sandwich islands, COOK describing those he saw, says,—“We also got some information of the existence of a low uninhabited island in the neighbourhood (of Tahoorā) whose name is Tammata-pappa.” (Feb. 1778). After COOK's death, the squadron sought for it: KING says,—“We stood to the S.W. in hopes of falling in with the island of Modoo-papappa, which we were told by the natives lay in that direction, about five hours' sail from Tahoorā.” After an ineffectual search for two days,—the position on one occasion being lat.  $21^{\circ} 27'$  N., long.  $161^{\circ} 18'$  W.,—the vessels made sail for the prosecution of their voyage; but KING observes, “it is possible that we might have passed it in the night, as the islanders described it to be very small, and almost even with the surface of the sea.” PORTLOCK and others also sought for it unsuccessfully.

It may safely be concluded that it has no existence, for the Hawaiian islands are now so much frequented that any such rock or shoal would be well known by this time. The natives' report could not refer to Bird island (to the N.W.-ward of the group), which they knew nothing of until 1789; besides which the latter is very lofty, not “even with the surface of the sea.”

#### ISLANDS, ROCKS, SHOALS, &c.

FROM LAT.  $20^{\circ}$  TO  $30^{\circ}$  N., AND FROM LONG.  $160^{\circ}$  TO  $180^{\circ}$  W.;  
BETWEEN THE HAWAIIAN ISLANDS AND OCEAN ISLAND.

**NECKER island** was discovered by LA PEROUSE in Nov. 1786. He describes it as rather more than  $\frac{1}{2}$  a mile long, and 380 feet high at most:—“it does not exhibit a single tree, but there is much grass towards the summit; the bare rock is covered with the dung of birds, and its white appearance affords a contrast to various red spots upon which the grass has not sprung up: from the distance of less than a mile, the sides appeared as perpendicular as a wall, and the sea broke so violently against them that it was impossible to land: . . . breakers appeared on every part of the coast except the S.E. point, where there is a small ledge of rocks extending seaward about 2 cables' length. I was desirous, before I continued my course, to ascertain whether ground was to be had; I accordingly sounded, as did also the *Astrolabe* which was nearly a league to leeward; we both found but 22 fathoms, on a bottom of broken shells,—a depth much shallower than we had expected. It appears to me that Necker is but the summit of an island that was once very much larger than it is at present, and that by degrees the sea has undermined and dispersed the softer parts; the rock, however, which remains is very hard, and will for many ages resist the action of atmosphere and water. As it was of much importance to ascertain the extent of the bank, we continued to sound, directing our

course westward; the depth gradually increased with our distance from the land, and 10 miles off we had no bottom with 135 fathoms of line; but over the whole space of the 10 miles the bottom was of coral and comminuted shells." (LA PÉROUSE.)



*Necker Island, W. by N., distant 7 miles. (La Pérouse.)*



*Necker Island, N.N.W.  $\frac{1}{2}$  W., distant 1 mile. (La Pérouse.)*

Lieut. BROOKE (U.S. surveying schooner *Fenimore Cooper*) made the island  $\frac{3}{4}$  of a mile long (W. by N. and E. by S.) and 340 yards broad, with two peaks, one at each longitudinal extremity,—the western one about 280 feet high, and the eastern one 250 feet; a small islet about 100 yards to the northward is connected with the larger by a reef, and there is a small detached rock close to the east end; there were 15 to 18 fathoms water at 2 miles' distance, in a N.E.-ly direction.

Capt. PATY of the *Manuokawai* could not see any landing-place for boats, as the surf broke high all round the island; a bank of sand and rocks makes off to the south and west, 6 or 8 miles, or more; with the island bearing N.E., distant 2 miles, the depth is 18 fathoms.

Capt. BROOKS of the *Gambia* says that "on the S.E. end is a gulch or water-course, where, at certain seasons of the year there is probably a good flow of pure fresh water: at this point a good landing may be effected in moderate weather; the best anchorage is on the N.W. side. The island is surrounded by a bank or shoal making off to the southward, with about 14 fathoms water: this shoal is connected with, and in fact forms a part of that discovered by Capt. LONG, who thinks it makes off to the southward about 50 miles. The *Gambia* crossed it in lat.  $23^{\circ} 12' N.$ , and found it about 15 miles wide; the western edge is very abrupt, the soundings varying from deep-sea to 14 fathoms; the eastern edge slopes gradually, there being 35 fathoms water at a distance of 15 miles; the discoloration of the water may be seen at the distance of 3 miles from the mast-head. A vessel crossing this reef can, by heaving-to, take any quantity of fish of very fine quality." Capt. BROOKS also states that no danger exists beyond the rocks in the immediate vicinity of the island; but his description, coupled with that of LA PÉROUSE, makes it certain that there is an extensive bank of variable soundings, consequently there may be heads and pinnacles on it not yet known.

*Position*:—According to Lieut. BROOKE, U.S.N.,\* the centre of Necker island is in

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\* N.B.—The longitude of all the dangers examined by Lieut. BROOKE, of the U.S. surveying schooner, *Fenimore Cooper*, was carried from and back to Honolulu, and the wharf near the

lat.  $23^{\circ} 35' 18''$  N., long.  $164^{\circ} 39'$  W.,—which agrees with BROOKS of the *Gambia*; LA PEROUSE made it 7' more easterly, and STANIKOVITCH 8' more westerly,

**FRENCH FRIGATES shoal** or **BASSES DES FRIGATES FRANÇAISES**.—This very dangerous shoal was discovered in November 1786 by LA PEROUSE, the day after he left Necker island; it is described by him as a rocky bank, even with the water's edge, more than four leagues in extent, with three sand banks above water, and a small islet (110 feet high) to the N.N.W., in lat.  $23^{\circ} 45'$  N., long.  $165^{\circ} 50'$  W.

Lieut. BROOKE, U.S.N. (*Fenimore Cooper*), spent four days in an examination of it, sailing all around, and through the inner passages. The islet or rock (120 feet high, 180 feet base) with a small rock about 250 yards N.N.W. of it, he found in the centre of the reef. There were also five dry sand-spits; the largest  $\frac{3}{4}$  of a mile long, bearing from the centre rock N.  $76^{\circ}$  E. (*true*) 4 miles distant; the next N.  $45^{\circ}$  E. 6 miles distant; then a small one N.  $11^{\circ}$  E. 5 miles distant; then one N.  $8\frac{1}{2}^{\circ}$  E.  $4\frac{1}{2}$  miles distant, also very small; and lastly, one of  $\frac{1}{2}$  a mile diameter N.  $12^{\circ}$  W. 5 miles distant. Besides these, heavy breakers were seen N.W.  $\frac{1}{2}$  N. 6 miles from the rock; E. by S.  $\frac{1}{2}$  S. 9 miles; S.E. by E.  $\frac{1}{2}$  E. 5 miles; and S.W.  $\frac{1}{2}$  S.  $5\frac{1}{2}$  miles. A passage was found nearly in a straight line from the southward of the northwest breakers, close by the central rock (west of it), to the S.E. extremity of the reef, in from 12 to 17 fathoms.\*



The shoal is rudely crescent shaped, convex to the N.E.-ward; the *passage* here described leads between the S.W. horn of the crescent and some detached breakers, 5 miles to the westward; entering from the south side, the central islet bearing N. by W.  $\frac{1}{2}$  W. (*mag.*) would lead clear of all known danger; when up with the islet (to westward of it) a course N.W.  $\frac{1}{2}$  W. leads clear past the N.W. horn: proceeding through the shoal, from south to north, the soundings vary from broken shells, sand and coral, to rock, sand and coral.

Court House at that place was determined to be in  $157^{\circ} 50' 3''$  W. by meridian distances measured between San Francisco and Honolulu, and between Honolulu and Hong Kong by way of Guajan; this longitude coincides with that of Honolulu on the Admiralty chart within half a minute of longitude (King's Cottage flagstaff  $157^{\circ} 51'$  W.). The longitudes determined by Lieut. BROOKE, and here given, have been taken from the Chart issued by the U.S. Hydrographic Office in 1867, as the result of his survey in 1859. But in a work on the "Reported Dangers to Navigation in the Pacific," compiled at the Bureau of Navigation, Washington, U.S., and published in 1868, the longitudes of the various islands and dangers visited by Lieut. BROOKE are placed from 7' to 10' of long. *more to the westward*, the reason why is not stated; nor are they misprints, for the increase appears in all. The positions given on the chart are advisedly retained in this notice, as more consistent with the various other known observations.

\* Lieut. BROOKE's bearings are *true*, and he gives the variation as  $9^{\circ} 15'$  E. in 1859.

Captain Brooks of the *Gambia* (1859) says it is a circular or crescent shaped atoll, 45 miles in circuit, containing one principal island or rock, and 16 islets or sand-banks; one point of the crescent is N.W. and the other S.S.E. from the principal island. The island is 180 feet long, 45 feet wide, and 125 feet high, rising to a ridge in the centre; it is so steep and rugged as to be almost inaccessible. A rope was thrown over the top to enable the party to ascend. On each side of the ridge there is a level surface of about 12 feet square, and these contain the extensive deposits of guano, reported by the *Fenimore Cooper*. The ship *Modern Times*, of Boston, was chartered to load at this island, on the strength of the report. Captain Brooks took down a large number of native labourers from Honolulu, together with everything requisite for removing the guano. But on ascending the rock and carefully examining every part, not a shovelful was to be seen, except in the crevices. From these perhaps fifty tons might be gathered, but at a much greater expense than it would be worth. The *Modern Times* returned to Honolulu, but Captain Brooks remained several weeks making surveys, while the men were engaged capturing seals. While thus engaged, the ship *South Seaman*, of Fair Haven, ran upon the reef and was lost. This vessel was engaged in a whaling and trading voyage, and had left Honolulu only three days previously. Having passed the locality of these islands, about 30 miles, (as then laid down on the charts,) she was kept away to S.W. at about twelve o'clock at night, and soon after brought up against the reef, the breakers of which were running very high. She was under a speed of about eleven knots, and struck with such force as to rise with the breakers and continue her headway for about 2 miles over the reef, where she finally brought up in about 8 feet water, and nearly upright. The captain and crew took to their boats, laid off during the night, returned in the morning, took some water and provisions, and started for the Ladrone Islands, nearly two thousand miles away, supposing they had run upon an unknown reef. After steering on their course a few hours, they saw the mast and hull of the ship. They were kindly cared for and taken to Honolulu. A gang of men were left here to wreck the ship, while Captain Brooks proceeded to the westward, exploring the numerous islands and shoals of this whole chain. Spending the summer in this manner, the *Gambia* returned in September, and brought away these men and the effects which they had saved, together with a considerable quantity of seal skins, seal oil, sharks' fins, etc. These men, about twenty in number, were found living in a very comfortable manner, subsisting on fish, turtles, fowls and eggs, in which this group abounds, and had made a comfortable house from fragments of the wreck. Among the vessels known to have been lost here, are the *Two Brothers*, *Martha*, *Rebecca*, *South Seaman*, and *Daniel Wood*.

The island may be seen as far as a 500-ton ship, and at a distance of 5 miles has a remarkable resemblance to a full-rigged brig. This resemblance was the cause of the disaster to the whaleship *Rebecca*;—Captain PATTERSON cruising in the vicinity, towards nightfall made out what he supposed was a ship, and his signals not being answered, he attempted to run down to her. He was astonished, in a short time, by finding his ship striking the rocks, and in danger of being wrecked. He had run upon the S.E. extremity of the crescent-shaped reef. By good luck the ship forged over the reef, and the morning disclosed the supposed ship to be the above rocky islet. Vessels of any class can approach the rock

within a cable's length, and may anchor anywhere inside the reef in from 3 to 14 fathoms water. The bottom is composed of coral patches and sand. The entire shoal is protected on the N.E. and S.E. by a line of reef covered with heavy breakers. Inside of and forming a line with the reef are the 16 islets, varying in length from 1 mile to 100 feet. They are all low and sandy, the largest being about 4 miles N.E. by E. from the rocky islet. It was on this island that the crew of the *Daniel Wood* established themselves, although their vessel was wrecked on the reef some distance from it. Inside the island is a good lagoon anchorage, where the *Gambia* lay during her voyages there, moored with stern hawsers ashore. It is reached by a channel from the southward and eastward. Captain Brooks dug a well on this sand island, about 600 yards from the beach, and found brackish water, at a depth of 8 or 10 feet. It was used by his crew, and found to answer very well in place of fresher water. He also planted vegetables on the various islets, and left potatoes growing thrivingly on the island, but, as nothing of them has been reported, they must have perished. These shoals have heretofore been much dreaded by mariners, and been given a wide berth, but they afford chances for distressed or disabled vessels to go in and make repairs, when it may be impossible for them to beat up to Honolulu, —or dangerous to continue on to the westward. There is smooth water and good beaches, where a vessel may be hove down, if necessary. The waters swarm with fish and turtle. There is no danger outside the line of breakers; the current sets to the S.W.-ward, at about 2 knots; rise and fall of tide, at F. and C., nearly 2 feet.

That the French Frigates shoal is dangerous and should be especially avoided at night is evident from the account of LA PÉROUSE: in the evening he had seen Necker island, at 4 or 5 leagues' distance;—"we had never experienced a finer night, nor a more pleasant sea; but this tranquillity of the water was among the circumstances which had nearly proved fatal to us. Towards half-past one o'clock we saw breakers at the distance of 2 cables ahead of my ship. From the smoothness of the sea they made scarcely any noise; and some foam only, at distant intervals, was perceptible. The *Astrolabe*, a little further off, saw them at the same instant. Both vessels immediately hauled up to the S.S.E., and the nearest breakers could not, I conceive, be more than a cable's length off. I sounded, and we had 8 fathoms, rocky bottom; soon afterwards 9 to 11 fathoms; and in a quarter of an hour no ground with 52 fathoms of line." (LA PÉROUSE.)

*Position*:—Lieut. BROOKE, U.S.N., made the islet in the centre of the reef in lat.  $23^{\circ} 46' N.$ , long.  $166^{\circ} 16' 10'' W.$ ; E. extreme (heavy breakers), lat.  $23^{\circ} 44\frac{1}{2}' N.$ , long.  $166^{\circ} 4\frac{1}{2}' W.$ ; N. end, lat.  $23^{\circ} 52\frac{1}{2}' N.$ , long.  $166^{\circ} 15\frac{1}{2}' W.$ ; N.W. end of crescent (breakers), lat.  $23^{\circ} 51\frac{1}{2}' N.$ , long.  $166^{\circ} 20\frac{1}{2}' W.$ ; S.W. end of crescent, lat.  $23^{\circ} 41\frac{1}{2}' N.$ , long.  $166^{\circ} 12\frac{1}{2}' W.$ ; centre of detached breakers, lat.  $23^{\circ} 41\frac{1}{2}' N.$ , long.  $166^{\circ} 19\frac{1}{2}' W.$

LA PÉROUSE made the islet 26' more to the eastward; Captain Brooks, 2' more to the eastward. Captain NORTON of the *South Seaman*, when wrecked on the shoal in 1859, by his observations made it  $166^{\circ} 16' W.$ ; until that date it had been laid down in LA PÉROUSE's position.

*Brooks' bank*.—Capt. BROOKS of the *Gambia* (1859) after running about 30 miles W. by N. (W.N.W.) from French Frigates shoal, crossed a bank with 14

fathoms water on it, and saw the bottom distinctly. By a comparison of Capt. BROOKS' position of French Frigates shoal with that of Lieut. BROOKE's, U.S.N., this would give lat.  $23^{\circ} 51' N.$ , long.  $166^{\circ} 49' W.$  The U.S. "List of Reported dangers, &c.," gives lat.  $23^{\circ} 52' N.$ , long.  $166^{\circ} 55' W.$

N.B.—This shoal is not shown on the U.S. chart of Lieut. BROOKE's surveys, although it is there stated that some reported islands more to the N.W.-ward were not found either by Lieut. BROOKE or Capt. BROOKS: in fact there appears to be some confusion here; compare the notice of Gambia shoal, p. 61.

**GARDNER** island was discovered by Capt. ALLEN of the whaler *Maro* (1820); he described it as one mile in circumference, and 900 feet high; but by other concurring descriptions, it is merely an inaccessible rock 170 to 200 feet high, with a base of about 200 yards, and a smaller rock close to the S.W. extremity, from which a reef makes off about  $\frac{1}{2}$  a mile. A bank with 17 to 20 fathoms water surrounds the rock, extending westward 5 miles, and S.W.-ward more than 8 miles.



*Gardner Island, S.E. by S.  $1\frac{1}{2}$  m. dist.*

Capt. PATY of the *Manuokawai* says "the bank extends off to the south and west from 15 to 20 miles; bottom of detached rocks, with sandy spaces between. I had 17 fathoms water at the distance of 10 miles south of the island. I think fish are plentiful on it."

**Position** :—Lieut. BROOKE, U.S.N., places the centre in lat.  $25^{\circ} 0' 40'' N.$ , long.  $167^{\circ} 59' 5'' W.$ ; this is  $2\frac{1}{2}'$  eastward of that given by Capt. STANIKOVITCH.

**REEF** and breakers—called also Allen breakers—were discovered by Capt. ALLEN of the *Maro*. Capt. STANIKOVITCH of the Russian Navy describes it as 8 leagues in circumference, and visible from the deck 6 miles off. BROOKS (*Gambia*) says,—“it is about 35 miles in circumference; low and covered with breakers; no land or rock above water; consists chiefly of small detached patches of coral and sand. At times the breakers are very light, being scarcely distinguishable from sea-caps, hence great caution must be exercised in approaching it; on a clear day it may be seen from aloft at a distance of 5 miles. The shoal is nearly encircled by a bank with from 10 to 30 fathoms water as you recede from it. It is open to the westward, where there is good anchorage.” (Capt. BROOKS of the *Gambia*.)

Lieut. BROOKE, U.S.N., examined only the western side, and his position is that of the heaviest breakers at the N.W. extremity. The direction of the reef appeared to him N.N.E. and S.S.W., extending about 7 miles, with a bank of 20 fathoms water from 2 to 7 miles off. The extension of the reef towards the east was not ascertained; the breakers are very low, and the reef most dangerous.

*Position* :—By Lieut. BROOKE, the N.W. corner is in lat.  $25^{\circ} 31' N.$ , long.  $170^{\circ} 37' 33'' W.$ ; Capt. BROOKS made it in long.  $170^{\circ} 31' W.$

**LAYSAN** or **Møller island** is a whaler's discovery. Capt. STANIKOVITCH gave it the name of his vessel, not knowing it had been previously discovered; he described it as a small low island, of circular form, with a lagoon, and about 6 miles in circumference.

The various authorities make the island from 2 to 3 miles long, and from  $1\frac{1}{2}$  to 2 miles wide; it is surrounded by a reef, at the distance of  $\frac{1}{2}$  a mile from the land, outside of which is a bank 5 miles wide, with from 14 to 19 fathoms water over it; inside this bank there is a good boat passage nearly round the island, the only obstruction being on the south and S.E. side.



*Laysan Island. Centre of island E. by N. 1 mile dist.*

Capt. PATTY says "the bank of rocks and sand extends off to the north and west, 6 or 8 miles or more: good anchorage can be found on the western side of the island, in from 4 to 20 fathoms, by selecting a sandy spot to anchor on, from  $\frac{1}{2}$  a mile to 2 miles from the beach: the best landing is about one third of the distance from the northern to the southern point, where there is a very smooth sandy beach."

Capt. BROOKS reports that no danger exists beyond the line of breakers; that boats may land in safety on almost any part of the island; and that the best anchorage is on the west side, near the S.W. end,  $\frac{1}{2}$  a mile from the shore, in 8 to 12 fathoms water, coral bottom.

The island rises to the height of 20 or 30 feet, and encloses a lagoon a mile or more across, having a depth of 5 fathoms in the centre; its shores are fringed with crystallized salt of good quality. The soil of the island is, in many places, very rich, and covered with a luxuriant growth of grass and shrubs, among which are many flowering plants, and in 1859 there were five palm trees on it 15 feet in height. Water of tolerable quality may be obtained by digging to the depth of two feet.

The island abounds in land and sea-fowl, and many kinds of eggs may be had in abundance. Seal, turtle, and fish are numerous, and easily taken.

The shore is here and there strewed with wreckage, and Capt. BROOKS saw some redwood and pine from the N.W. coast of America, affording conclusive evidence of the general direction of the current.

*Position* :—Lieut. BROOKE, U.S.N., made the centre in lat.  $25^{\circ} 47' 47'' N.$ , long.  $171^{\circ} 42' 30'' W.$ ; Capt. BROOKS placed it  $6\frac{1}{2}$  more to the westward, as did Capt. STANIKOVITCH.

**LISIANSKY** island was discovered by Capt. LISIANSKY of the Russian ship *Neva* in 1805. According to his description, it is small and very low, of coral sand,

overgrown with grass, with a reef making out  $1\frac{1}{2}$  miles E.S.E. on which his vessel struck. Capt. MORRELL made it 6 miles in circumference, and says that the reef from the S.W. end makes out 7 miles.

Capt. PATY makes the island  $1\frac{1}{4}$  miles long, and the northern part 1 mile wide, and elevated from 20 to 40 feet above the sea. It is surrounded by detached rocks, which from E.S.E. to S.W. make off as far as the eye can reach. Good anchorage is found by getting the south point of the island to bear E.  $\frac{1}{2}$  S., and steering or working for it; in doing this the passage is between two large breakers, bearing North and South of each other about  $\frac{3}{4}$  of a mile apart, and 2 miles from the land; inside the breakers there is anchorage in from 4 to 8 fathoms, on sandy spots, about  $\frac{1}{2}$  a mile to  $1\frac{1}{2}$  miles from the beach. There has been a lagoon near the south part of the island; and fresh water was found by digging down to the depth of five feet. The surface of the island is almost overgrown by grass. Birds, fish, seal and turtle abound, but not to the same extent as at Laysan island.

Capt. BROOKS says it is 3 miles across at the widest part, and the most elevated point is 50 feet high. It is encircled by a reef, which, on the west side, forms a lagoon  $2\frac{1}{4}$  miles wide, in which there is good anchorage in from 4 to 12 fathoms water; the entrance to the lagoon is marked by two heavy breakers, bearing N. and S. from each other,  $\frac{3}{4}$  of a mile apart; between these breakers are several small rocks near the surface, and to avoid them a man should be kept aloft; inside the lagoon is a number of scattered rocks, but as the water is smooth they are easily avoided. The approach should be made from the north, as a low and dangerous reef makes off to the southward, and in moderate weather the breakers on it can scarcely be distinguished from sea-caps; on the north and west sides no dangers exist outside the line of breakers. Near the south end of the island is the basin of what was once a lagoon, but it is now overrun with weeds &c.; a plentiful supply of water may be had by digging but a few feet; the deposit of guano is thin and of inferior quality. There was much wreckage about, and it was here the *Holder Borden* and *Konnokassett* were lost; from the state of the island wrecked crews have frequently stayed some time. Rise and fall of tide 2 feet.

There is the same indication of the current from the N.W.-ward as at Laysan island.

This island has probably been reported under many other names, as Saprón, Pell, Lessiano &c.

Lieut. BROOKE, U.S.N., could not make the island on account of stormy weather. It has been reported in the following positions:—

By Captain LISIANSKY,	lat. 26° 2' 48" N.,	long. 173° 42' 30" W.
" " MORRELL,	" 25 59 0 "	" 173 44 0 "
" " PELL,	" 26 1 0 "	" 173 51 0 "
" " PATY,	" 26 0 30 "	" 173 57 0 "
" " BROOKS,*	" 26 0 0 "	" 173 50 30 "
Probable position (mean)	" 26 1 0 "	" 173 49 0 "

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\* Capt. BROOKS gives 173° 57' W., but at Laysan island he was  $6\frac{1}{2}$ ' too far west by Lieut. BROOKS's position; the mean of the positions given above seems very probable.

**LISIANSKY bank** :—Lieut. BROOKS, U.S.N., found bottom at 15, 17, 18, 20, 25 and 40 fathoms, between the parallels of  $25^{\circ} 43'$  and  $26^{\circ} 3' N.$ , and between the meridians of  $173^{\circ} 19'$  and  $173^{\circ} 22' W.$ , "apparently the tail of a bank running out to the S.E.-ward from Lisiansky island." It has been reported by others;—by one whaler in lat.  $26^{\circ} N.$ , long.  $173^{\circ} 24' W.$ , and is probably the Delaware bank of Captain PELL (the long. given being  $1^{\circ}$  too far east), who makes it extend N.W. and S.E. 30 miles. Whether it reaches to Lisiansky island, or whether there are shoaler spots on it than here given, is unknown.

**PEARL and HERMES reef** was discovered by the English whale ship *Pearl*, and the ship *Hermes*, being lost on it in 1822. They were cruising in company one night under easy sail, and struck on the S.E. part of the crescent. The keel, stem and stern post may still be seen, down in the depths of the transparent waters. They remained a long time upon these islands, living chiefly upon pounded beans recovered from the waters, together with seals, turtle, fowls, fish, and eggs, and succeeded at last in constructing a vessel of about 15 tons, and after laying in a good supply of dried fish, seals, meat, etc., they bid good-bye to their desolate island prison and set sail for the Hawaiian islands, where they arrived after a long and perilous voyage of six weeks, and where some of them are now living.

It has generally been very incorrectly laid down and described. Of the reef 60 miles to the N.E. and S.W. nothing exists. According to Capt. BROOKS it contains twelve islands and islets, surrounded by a line of reef, on which the sea breaks heavily. Inside there is a lagoon, in the middle of which vessels may lie in from 3 to 15 fathoms water, but they cannot approach within 2 miles of the islands; and the only passage to the lagoon is from the N.W. The largest island is  $2\frac{1}{2}$  miles long, and has but little vegetation upon it. There is good anchorage anywhere outside the reef, in from 8 to 12 fathoms water, but the best is on the N.W. side near the passage. The principal island lies E. by S.  $\frac{1}{2}$  S. from the passage. Outside the reef is a bank, which makes off about a mile. The rise and fall of tide is about 2 feet. A variety of excellent fish may be easily obtained. But seal, turtle, &c. are not so abundant as at Lisiansky island.

Capt. STANIKOVITCH passed through the reef and anchored nearer the largest island.

Capt. MORRELL says that on the exterior of the reef the water is very bold on the east side, there being a depth of 100 fathoms within three times that distance from the shore; on the west side, however, the water runs off shallow for a considerable distance to 35 fathoms; thence it deepens very suddenly to 120 fathoms; and  $\frac{1}{2}$  a mile further off shore no sounding with the ordinary lead. He describes the reef as a continuation of small islands, covered with sand and rock, forming a crescent, the concave side of which, facing W.N.W., encloses an extensive bay, with good anchorage in from 4 to 25 fathoms.

It has recently (1867) undergone a partial examination by Capt. W. REYNOLDS, commanding U.S. steamer *Lackawanna*; he says:—

"Pearl and Hermes reef, like Ocean and Brooks islands to the westward, has a coral wall above water at its N.W. extreme, which, however, shows more in the shape of detached rocks than as a continuous parapet, and, soon expending itself

beneath the surface, does not reappear, at least so far as our examination showed; this was not very close, as I had time only to get the outline of the reef.

"The N.E. corner includes a sand island. Another showed itself some miles to the westward in the lagoon. Three others lie along the southern edge of the reef, which, turning to the northward and westward, close to the westernmost island, soon after ceased to show any signs of breakers. Shoal water, however, makes out for some miles to the west, and then trends in north-easterly towards the N.W. rocks. In this the western side of the reef resembles French Frigates shoals.

"We made the circumference of the reef to be 42 miles. Its shape is irregular, its diameter from N. to S.  $9\frac{1}{2}$  miles, from E. to W. 16 miles.

"Position:—N.E. point of reef, lat.  $27^{\circ} 56' 30''$  N., long.  $175^{\circ} 46' 0''$  W.;—S.W. end of reef, lat.  $27^{\circ} 48' 45''$  N., long.  $176^{\circ} 0' 30''$  W.; S.E. point of reef, lat.  $27^{\circ} 48' 45''$  N., long.  $175^{\circ} 47' 30''$  W."

N.B.—This is  $27'$  to the eastward of the position given by DUPERRY, F.N.;  $9'$  westward of that given by STANIKOVITCH; and  $23'$  eastward of MORRELL's position; but agrees tolerably well with the long. of CAPTS. PATY and BROOKS, and with the mean of all the assigned positions. It has been at times reported as *Hennis* island.

*Gambia* shoal was discovered by Capt. BROOKS of the *Gambia* (1859); he states it to be 40 miles W. by N. from Pearl and Hermes reef; bottom distinctly seen; 14 fathoms water over it; another report says 114 fathoms; (compare "BROOKS" shoal, p. 56). Capt. W. REYNOLDS' position of Pearl and Hermes reef would place this shoal in lat.  $27^{\circ} 58' 45''$  N., long.  $176^{\circ} 46' 45''$  W.; on the U.S. chart issued by the Hydrographic Office in 1867, it is in lat.  $27^{\circ} 50' 45''$  N., long.  $176^{\circ} 31\frac{1}{2}'$  W. which makes it about 30 miles westward of Pearl and Hermes reef.

**MIDWAY or BROOKS islands**, first made known by Captain BROOKS of the bark *Gambia*, were surveyed in 1867 by Captain WM. REYNOLDS, U.S. Navy, Commanding U.S. steamer *Lackawanna*. The following description of them has been published by the U.S. Hydrographic department:—

"The reef encircling BROOKS island is pear-shaped, with its stem part to the eastward; it is 18 miles in circumference, as measured by the patent log in the two circuits around it, and is without a break, except on its western side. At the north-west point is a little patch of breakers, a few detached rocks, and then commences a compact coral wall of about 5 feet elevation, and, as far as our observation went, from 6 to 20 feet in width, which continues for  $4\frac{1}{2}$  miles to the southward and eastward, when it loses its uniformity of surface, and presents a line of detached rocks, very little more than a wash, for  $2\frac{1}{2}$  miles to the southward; there, off the centre of MIDDLE BROOKS island, the rocks dip under water, but reappear 2 miles to the westward, from whence they again show as a continuous wall for about  $4\frac{1}{2}$  miles to the northward and westward, ending there, and forming the south side of the entrance to WELLES harbour.

This entrance is about  $\frac{1}{2}$  of a mile wide, and from its northern edge to the N.W. rocks there is a bed of coral from 1 to 16 fathoms, showing above water in one place, with occasional breakers. (N.B.—The Chart shows the entrance to be only  $\frac{1}{3}$  of a mile wide.)

The northern, eastern, and southern portions of the reef are steep-to, to the rocks. We saw the bottom in two places only where the soundings are shown on the chart.

On the west side, sheltered *anchorage*, during the Trade-winds, can be had in from 10 to 13 fathoms, but on a very foul bottom. The best outside anchorage is in *Seward roads*, in 10 to 13 fathoms water.

At the eastern extremity of the reef, or in the stem of the pear, is **Middle Brooks** island, also pear-shaped,  $1\frac{1}{2}$  miles in length and  $\frac{1}{2}$  a mile wide, of a nearly uniform elevation, varying from 6 to 15 feet, covered with a growth of small shrubs, coarse grass, and some vines. The soil is all coral, sand, and shells, except a small portion on the south side, where there are a few acres of mould two feet in depth. No black earth is to be found on this island. The beach is of a dazzling whiteness.

By digging 4 to 7 feet water is reached, which becomes potable after standing. Specimens of the soil, vegetation, and some of the water are forwarded with this report.

At  $1\frac{1}{4}$  miles west of Middle Brooks island is **Lower Brooks** island, (a small spit intervening); this island is a sand heap of irregular shape,  $1\frac{1}{2}$  miles long,  $\frac{3}{4}$  of a mile broad, and 57 feet high at the flagstaff, its greatest elevation.

Vegetation is just commencing on this island, in the shape of detached clumps of shrubs around portions of its edge, and an occasional growth of grass, the greatest abundance being on its south-western extremity. No black earth is to be found on it; on the contrary, the glare from the white sand distresses the eye.

Captain BURDETT informed me that he had seen 250 yards of it wash away, and begin to reform, during the few weeks he had been ashore. The sand spit up by the north-west rocks, which was quite conspicuous when we anchored near it on the 16th, had almost disappeared by the 27th, when I landed on it; but, from the quantity of sand thereabouts, I presume a permanent sand island is forming.

On the lower island the agent of the Pacific Mail Company has established himself because it borders on the harbour.



*Lower Brooks or Sand Island; Flagstaff bearing E.S.E.  $\frac{1}{2}$  E.*

**Welles harbour** is formed very much like that of Honolulu; is rather more roomy and as safe, but has not quite the same depth of water on its bar, having but from 21 to 16 feet at low water.

The bar is quite narrow, and has an uneven bottom of coral rock and small sand holes; its depth varies from 21 to 16 feet, but changes so often and so constantly from  $3\frac{1}{2}$  to 3 fathoms, as to make it unsafe to count on crossing it without getting a 3-fathom cast or two. We had 19 feet going in, and two casts of 18 feet going out, both times at low water.

Like Honolulu, the entrance to it is from the west, through a narrow opening in the coral reef 800 feet across where most contracted. It can be entered as readily as Honolulu at all seasons of the year. Depth of water for anchoring 5 to 7 fathoms, white sandy bottom. The flagstaff on Lower Brooks island bearing E.S.E.  $\frac{1}{2}$  E.

leads in,—bearing E.S.E.  $\frac{1}{2}$  E. it covers a shoal spot of  $2\frac{1}{2}$  fathoms nearly in the centre of the harbour. (*By the Chart.*)

This harbour is cut off from the lagoon by shoal water a mile in width; and a careful survey does not disclose a passage anywhere for ships into the lagoon.

It would be possible for a light-draught vessel to get into the lagoon by passing to the northward of the 'middle ground,' and threading her way in among the rocks, but no channel proper for ships exists.

The lagoon is 2 miles in length, and  $1\frac{1}{2}$  miles wide at its greatest breadth. There are many coral lumps in it, with from 1 to 2 fathoms water over them; otherwise these soundings are regular, over a white sandy bottom.

Welles harbour must, therefore, be the resort for ships drawing less than 18 feet, —or at high water, of a little over that draught. Vessels of deep draught must lie in Seward roads, picking out a sandy bottom to let go in.

The greatest rise and fall of the tide, observed during the neap tides, was 18 inches; the lowest 15 inches. Ebb runs  $6\frac{1}{2}$  hours, flood  $5\frac{1}{2}$  hours. From the look of the beach I suppose the rise of spring tides is as much as 3 feet, which would allow a deeper draught to be carried over the bar at those periods. The bar is well within the entrance, and there is no swell on it during the Trade-winds.

At our outside anchorage the direction and strength of the current were taken every half hour. The flood sets to the northward, the ebb to the southward, from 1 knot to 2 fathoms. At Welles harbour the current *always* ran out to the westward, with very little strength.

The coral shelf which runs from the N.W. end of the reef to the southern wall gives very irregular soundings, having deep fissures between the rocks, and again spaces of sandy bottom. On this shelf at our anchorage of the 23rd of August, we lost one anchor with 15 fathoms chain, and broke the flukes off of another; and could not recover either of them, although we searched for five days.

Two circuits of the reef made with good lookouts aloft, disclosed no dangers outlying it: and, so far as our observation goes, Pearl and Hermes reef to the eastward, and Ocean island to the west, are the only dangers in the way of direct approach.

During our stay of 17 days we had mostly fine clear weather, with light winds from N.N.E. to S.S.E. On the 28th August, it blew hard from south and S. by W. for some hours, with rain. Rain fell on six days, mostly, however, between sunset and sunrise, and but seldom accompanied with wind. Capt. BURDETT informed me that during his stay of four weeks before our arrival strong Trades had prevailed with clear weather. On the day we left, the wind came out S.W. by W.

Steamers, in approaching Brooks island from the eastward, should make Middle Brooks island, and follow the southern wall to the entrance of the harbour. If coming from the west the Lower island should be made. Sailing vessels from the eastward, during the Trade season, should keep to the northward of the reef, and pass around the N.W. rocks to retain a fair wind for Seward roads. Square-rigged vessels must warp into the harbour with easterly winds.

On the N.E. beach of Middle Brooks island, a broken lower mast of a ship is lying, the step and head wanting; it is  $2\frac{1}{2}$  feet in diameter, and had been finished and strengthened with iron bands. On the east beach and on the bluff, occasional drift timber is to be met with and some lumber, mostly spruce and redwood. On the

west side, or lagoon beach, is a portion of the trunk of a redwood tree 5 feet in diameter, and also the skeleton of a calf sperm whale.

On the lagoon side of the other island, two lower masts of junks are stranded, and several redwood logs elsewhere—one of these over 2 feet in diameter.

Tropical birds, men-of-war hawks, and gulls, swarm upon these islands. A few curlew and plover are the only land birds met with. Turtle abound, but seals were seen only occasionally. Fish of many varieties in great abundance; we hauled the seine frequently, catching enough for all hands; among them many very fine mullet.

*Position* :—Welles harbour (anchorage) lat.  $28^{\circ} 14' N.$ , long.  $177^{\circ} 23' 15'' W.$ ;—N. point of Lower Brooks or Sand island, lat.  $28^{\circ} 13\frac{1}{2}' N.$ , long.  $177^{\circ} 21\frac{1}{2}' W.$ ; N. point of the eastern or Middle Brooks island, lat.  $28^{\circ} 13\frac{1}{2}' N.$ , long.  $177^{\circ} 18' 20'' W.$

Mr. S. D. KENNEDY, Surgeon U.S. Navy, also made an examination of the soil, growth, and water upon Brooks island, and reports as follows—

These are two long low islands chiefly formed of coral, shells and sand. They lie in a lagoon surrounded by a barrier reef, except at one point, where a breach in its continuity affords an entrance of 3 fathoms in depth.

The east island is 1 mile in length and  $\frac{1}{2}$  a mile in width; while the west island is somewhat larger and higher, but has less soil and scantier vegetation. A beach consisting of white sand, disintegrated shells and coral, extends from the lagoon to a distance of from 50 to 100 yards all around the east island. Inside of this space the island, gradually sloping from its two highest points, (the north-eastern 15 feet, and north-western 8 feet), is covered with a growth of coarse grass and low shrubs. From its north-eastern point, a ledge of coral rock, lying at an angle of 5 degrees, extends about 100 yards into the lagoon. From this point, a fringing reef of the same kind of rock at about the same declination runs for  $\frac{2}{3}$  of the extent of the eastern side of the island. Judging from this peculiarity of coral formation, and the numbers of dead shells, corals, and mollusks found on the highest points, this portion of the island seems to be emerging. Over all that part of the island where vegetation is found, there is a superficial layer of fine, porous, grayish sand; but generally it is devoid of vegetable mould; beneath, you come at once to coarse sand and gravel.

On the south side of the island there is a slight depression, embracing about 5 acres, extending from N.N.E. to S.S.W. This area has a superficial stratum of vegetable mould from 18 inches to 2 feet in depth, mixed with a small percentage of guano; beneath this is a layer of coarse sand of the depth of one foot, and below this another stratum of loose stone, shells, and corals, closely packed together, extending down to the hard coral. The foundation of the island, as of the reef, consists of madrepore, meandrina, and porites coral. But little of the red coral can be found about the island or in the lagoon. This embraces the whole extent of anything like true soil that I was able to find on the islands. This mould is, I think, of sufficient richness to raise potatoes, peas, beans, and other vegetables adapted to light soils. There is a small amount of guano mixed with it, and with cultivation it would doubtless become richer by the addition of decomposed vegetable matter.

The vegetation of the island consists entirely of shrubs, herbs, and coarse grasses; none of the shrubs are over 3 to 5 feet high. Of these, and the herbs, the principal



seen from the mast-head to the distance of 8 miles. A bank makes off round the reef at a distance of a mile with 20 to 30 fathoms water on it. The opening into the reef is rather less than a mile wide. The best anchorage is on the west side, near the N.W. point of breakers, in from 8 to 12 fathoms water, rocky bottom. From the appearance of the islands they are sometimes visited by very severe storms, the sand being thrown into numerous cones and pyramids. There were but few birds, but plenty of crabs and turtle, also some eggs, and much wreckage.

Capt. W. REYNOLDS, U.S.N., visited it in 1867, and states that—"Ocean island is almost the facsimile of Brooks island, as will appear from an inspection of the chart. It commences also with a coral wall at its N.W. extreme, which continues without a break until it dips under water about the centre of Green island, but does not crop out again. From the end of the wall, the line of breakers continues to their termination about a mile west of the N.W. end of Sand island; from thence to the N.W. rocks the water is shoal, and affords no entrance into the lagoon, all of which is shallow water.

**Green** island in the S.E. corner of the lagoon is identical in appearance from seaward, with Middle Brooks island; except that some portions of the shrubbery appeared to have grown a foot higher. There is a small sand spit between it and **Sand** island, as is the case at Brooks island; but the sand island here has not more than 10 feet elevation above the level of the sea. The trunk (and roots) of a large tree was lying high and dry on the S.E. side of this sand island, and on the N.E. end of Green island we saw a ship's lower mast, which looked as if it had recently got ashore.

This reef is  $14\frac{1}{2}$  miles in circumference; no outlying dangers seen from the mast-head, and no other land.

*Position*:—Sand island, centre, lat.  $28^{\circ} 24' 45''$  N., long.  $178^{\circ} 27' 45''$  W.;—N.W. point of Green island, lat.  $28^{\circ} 24' 50''$  N., long.  $178^{\circ} 26' 5''$  W."

Capt. STANIKOVITCH had made the island in lat.  $28^{\circ} 27'$  N., long.  $178^{\circ} 23\frac{1}{2}'$  W.; and the mean of many other reports placed it in lat.  $28^{\circ} 26'$  N., long.  $178^{\circ} 30'$  W.

It has been frequently reported as *Ocean*, *Curé*, *Stavers*, *Massachusetts*, and *Dry* island.

**KRUSENSTERN** rock, discovered by Capt. LISIANSKY, and placed in lat.  $22^{\circ} 15'$  N., long.  $175^{\circ} 37'$  W., is stated to have a bank around it stretching N. and S. about 2 miles, and the sea on it broke in one place. It has also been reported by a whaler as *Souder island* in lat.  $22^{\circ} 10'$  N., long.  $175^{\circ} 42'$  W. On some charts there is a *Pylstart island*, 28 miles to the northward, and is probably identical with it.

The following islands, shoals, and rocks, have been reported, at various times, as existing within the area indicated on page 52; the greater part of these refer to the islands and reefs previously described, while others are not known otherwise than by the single record here given.

1. A reef, whaler's report, in lat.  $20^{\circ} 30'$  N., long.  $152^{\circ} 50'$  W.; not otherwise known, and extremely improbable, being only 125 miles eastward of Hawaii; there is another reported reef in the exact lat. and long. numerically, but long. E.

2. *Philadelphia* or *Maria Lazara island*, whaler's report, lat.  $29^{\circ} 4' N.$ , long.  $155^{\circ} 46' W.$ ; not otherwise known.

3. *Arabia shoal*, reported to Prof. BACHÉ, late Supt. U.S. Coast Survey, by the captain of ship *Arabia*; "sailed over a shoal with a large quantity of kelp fast to it, extending S.S.E. and N.N.W. 2 miles, by 1 mile in breadth; lead gave 11 fathoms in several places;" lat.  $29^{\circ} 30' N.$ , long.  $155^{\circ} 55' W.$ ; not otherwise known (see report above); very doubtful.

4. *Pollard reef*, a whaler's report, in lat.  $24^{\circ} 4' N.$ ,  $160^{\circ} 8' W.$ , could hardly exist so near the Hawaiian islands without being known; it was not found by Capt. W. REYNOLDS, U.S.N., in 1867.

5. *Decker island*, a whaler's report, in lat.  $23^{\circ} 24' N.$ , long.  $163^{\circ} 5' W.$ , halfway between Bird and Necker islands, is improbable: some charts give Decker island (doubtful) in the same latitude, but long.  $163^{\circ} 5' E.$

6. *Frost shoal*, reported by the ship *E. L. Frost*, in lat.  $23^{\circ} 45' N.$ , long.  $163^{\circ} 30' W.$ , less than 100 miles W.N.W. from Bird island, with 17 to 20 fathoms water on it, coral bottom, and upwards of 50 miles in extent from north to south, is unknown,—and may be a misprint; it probably refers to the bank extending southward from Necker island (p. 53).

7. An island in lat.  $24^{\circ} 6' N.$ , long.  $167^{\circ} 55' W.$ , and the Two BROTHERS reef of KRUSENSTERN in lat.  $24^{\circ} 14' N.$ , long.  $168^{\circ} 30' W.$ , were sought for by Lieut. BROOKE, U.S.N., and Capt. BROOKS (1859) and not found, "although there was every indication of land in the vicinity." It is now known that the *Two Brothers* was lost on the French Frigates' shoal.

8. An island, a whaler's report, in lat.  $24^{\circ} 40' N.$ , long.  $168^{\circ} W.$ , is unknown; probably Gardiner island (p. 57).

9. *Pollard island*, a whaler's report, in lat.  $25^{\circ} 48' N.$ , long.  $168^{\circ} W.$ , is unknown; probably Gardiner island (p. 57).

10. *Pollard Island*, a whaler's report, in lat.  $24^{\circ} 50' N.$ , long.  $168^{\circ} 23' W.$ , was sought for by Capt. PATY, without discovering any appearance of land; probably Gardiner island (p. 57).

11. An island, in lat.  $28^{\circ} 35' N.$ , long.  $171^{\circ} 42' W.$ , whaler's report;—not known; sought for by Capt. W. REYNOLDS, U.S.N., and not found.

12. *Neva island*, lat.  $25^{\circ} 50' N.$ , long.  $172^{\circ} 20' W.$ ; sought for, and the position passed over by Capts. PATY and BROOKS; not found; probably Laysan island (p. 58).

13. *Philadelphia island*, a whaler's report, in lat.  $28^{\circ} 20' N.$ , long.  $172^{\circ} 30' W.$ ; as reported to KOTZEBUE the lat. was  $28^{\circ} 15'$ ; Capt. PATY could not find anything in the position given.

14. *Bunker island*, a whaler's report, in lat.  $28^{\circ} N.$ , long.  $173^{\circ} 20' W.$ ; Capt. PATY could not find it, nor could Capt. W. REYNOLDS, U.S.N. (1867).

15. *Palmer reef*, in lat.  $20^{\circ} 54' N.$ , long.  $173^{\circ} 25' W.$ , has 4 feet water on it

according to the account of Capt. PALMER of the *Kingfisher*; nothing further is known of it.

16. *Sapron Island*, a whaler's report, in lat.  $26^{\circ} 2' N.$ , long.  $173^{\circ} 35' W.$ , is Lisiansky island (p. 58).

17. *Drake island*, a whaler's report, in lat.  $25^{\circ} 30' N.$ , long.  $174^{\circ} W.$  is probably Lisiansky island (p. 58).

18. *Delaware bank*, reported by Capt. PELL of the *Delaware*, as a bank extending N.W. and S.E. about 30 miles, apparently very shoal, in lat.  $25^{\circ} 50' N.$ , long.  $174^{\circ} 26' W.$ , is probably the bank stretching S.E. from Lisiansky island (p. 60); the report being in error  $1^{\circ}$  of long.

19. *Pell island*, in lat.  $26^{\circ} 1' W.$ , long.  $174^{\circ} 51' W.$ , reported by Capt. PELL of the *Delaware*, is Lisiansky island (p. 58); the report being in error  $1^{\circ}$  of long.

20. *Delaware reef*, said to be reported by Capt. HUNT of the brig *Delaware*, in lat.  $27^{\circ} 28' N.$ , long.  $174^{\circ} 25' W.$ ; described as dry; 12 or 14 miles long, with several other shoals in the neighbourhood;—it is unknown, and when sought for by Capt. W. REYNOLDS, U.S.N. (1867) could not be found.

21. *Hennis island*, a whaler's report, in lat.  $27^{\circ} 46' N.$ , long.  $175^{\circ} W.$ ; and again in lat.  $27^{\circ} 46' N.$ , long.  $176^{\circ} W.$ ; is the Pearl and Hermes reef (p. 60).

22. An *island*, whaler's report, in lat.  $29^{\circ} N.$ , long.  $175^{\circ} 42' W.$ ; nothing known of it; could not be found by Capt. W. REYNOLDS, U.S.N. (1867.)

23. *Souder island*, in lat.  $22^{\circ} 10' N.$ , long.  $175^{\circ} 42' W.$ ; and *Pylstart island*; see Krusentern island (p. 66).

24. An *island*, whaler's report, in lat.  $21^{\circ} N.$ , long.  $176^{\circ} 31' W.$ ; nothing is known of it. *Palmer reef* (see above, No. 15) is in nearly the same latitude, but stated to be  $3^{\circ}$  more to the eastward.

25. *Massachusetts island*, a whaler's report, in lat.  $28^{\circ} 30' N.$ , long.  $176^{\circ} 50' W.$ ; Capt. PATY ran over the position without finding it, and so did Capt. W. REYNOLDS, U.S.N. (1867); probably Midway island (p. 61).

26. *Sand island*, placed by Capt. MOREL of the *Napoleon III.*, in lat.  $28^{\circ} 10' N.$ , long.  $177^{\circ} 22' W.$ , and by Capt. DAGGET of the *Oscar* in lat.  $28^{\circ} 15' N.$ , long.  $177^{\circ} 35' W.$ ; also stated to be in lat.  $28^{\circ} 10' N.$ , long.  $177^{\circ} 12' W.$ , and in lat.  $28^{\circ} 12' N.$ , long.  $176^{\circ} 50' W.$ ; probably Midway island (p. 61).

27. *Curé*, *Stavers*, and *Dry islands*, variously reported between lat.  $28^{\circ} 22'$  and  $28^{\circ} 35' N.$ , and between long.  $178^{\circ} 23'$  and  $178^{\circ} 42' W.$ , are Ocean island (p. 65).

28. An *island*, whaler's report, lat.  $28^{\circ} 12' N.$ , long.  $178^{\circ} 50' W.$ ; Capt. BROOKS passed over the spot without seeing anything; probably Ocean island (p. 65).

29. *Buckler island*, a whaler's report, in lat.  $28^{\circ} N.$ , long.  $178^{\circ} W.$ ; may be either Ocean or Midway island, the position being between the two (p. 61-66).

30. An *island*, a whaler's report, and marked on some charts doubtful, in lat.  $28^{\circ} 30' N.$ , long.  $179^{\circ} 20' W.$ , is not otherwise known.

## MARIANA OR LADRONE ISLANDS.\*

The **ISLAS MARIANAS**, a Spanish colony, constitute an archipelago, or *chain of islands* extending 440 miles, from lat.  $13^{\circ} 12'$  to  $20^{\circ} 32' N.$ , between long.  $144^{\circ} 37'$  and  $145^{\circ} 55' E.$  In origin they are all volcanic, and some of the cones are still active. Their total area is about 395 square miles, and in 1864 they contained a population of 5595 persons.

They may be divided into three groups, as follows :—

1. The *Southern* group, consisting of the islands of Guajan, Rota, Aguigan, Tinian, and Saipan. These are larger and probably older than the others; though of moderate height they are the least mountainous, and at present are the only inhabited islands of the whole chain.

2. The *Central* group, consisting of the Farallon de Medinilla, Anatajan, Sariguan, Guguan, Alamagan, Pagan, and Agrigan. These are a collection of large rocky islets rather than islands, in some of which the volcanoes are extinct, in others active; and it is probable that at a former period some of them may have been inhabited.

3. The *Northern* group, consisting of the islands of Asuncion, the Urracas, and Pajaros, are merely volcanic cones, of which the first is extinct, the second is a broken down crater, and the third alone is in full activity.

N.B. The islets formerly known as the Mangs or Monjas do not exist; nor is there any island called the Farallon de Torres,—this name being the origin of an error which the voyage of the *Narvaez* dissipated. The only reliable description and chart of the Marianas to this time had been the result of FREYCINET's limited and superficial survey.

**History of the Discovery of the Islands.**—It is known that the Marianas were discovered by HERNANDO DE MAGALLANES (MAGALHAENS) on the 6th of March 1521, but there are doubts as to which of the islands he saw; some think he only visited Tinian, Saipan, and Aguigan; but the track of his voyage on the chart published by the Spanish Hydrographic office shows the ships to have passed through the channel between the islands of Guajan and Rota, and he probably brought up at Agaña. Some of his people named them "islas de las velas latinas," (*Islands of the Lateen Sails*), from the numerous peculiar boats met there,—a kind of canoe with two prows, and carrying triangular mat sails, similar to those still used by the natives of the Caroline islands; but MAGALLAN called them the Ladroneas, as he fancied the islanders had a propensity for thieving, and this name they retained until 1668, when they received that of the Marianas in honour of queen MARIA AÑA of Austria, widow of PHILIP IV. and mother of CHARLES II. Now they are as frequently called by the one name as the other.

The expedition commanded by GARCIA DE LOAISA which left Spain shortly after the departure of MAGALLAN also touched at these islands; as did that of JUAN SEBASTIAN DE ELCANO, to whom the emperor CHARLES V. gave, as a crest, a globe with the motto,

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\* These islands were surveyed and examined by D. EUGENIO SANCHEZ Y ZAYAS, Commander of the Spanish corvette *Narvaez* in 1864-5, and a full description of them is given in the "Anuario de la Direccion de Hidrografia," año iii. (1865). This account is a summary of that article.

"Primus circumdedisti me." The latter brought up at Umata in Guajan, in January, 1526, and remained there four days. The next expedition was that of ALVARO DE SAAVEDRA which was fitted out at Siguatanejo in Mexico, and reached Umata on the 29th of December, 1527. But Spain about this time was too much absorbed in other and greater conquests to devote any considerable attention to the Ladrões. They had been styled *small islands* by MAGALLAN, without remarking that one at least of the two he had seen was scarcely less than Minorca; therefore they were not immediately appropriated.

Neglected for some time, as being useful in no other sense than that of affording a supply of water or provisions to any passing vessel, they were not territorially annexed until 1565, when DON MIGUEL DE LEGAZPI took possession of them for the King of Spain. Mass was celebrated there, and he was the first who named them the Marianas. But this proceeding was purely nominal, for the religious service having been gone through, LEGAZPI and his people returned to their ship, and continued the voyage to the Philippine islands; thus, notwithstanding that the Ladrões afforded the only place for the refitting of vessels bound from Mexico to that archipelago, and that the Dutch, in their wars with Spain, made a point of attacking the galleons there, the Spaniards did not establish themselves on the islands for more than a century later—that is, in 1668.

A Jesuit, the PADRE DIEGO LUIS DE SANVITORES, going from Acapulco to Manila touched at the Ladrões, and was the first who entertained the idea of subjugating them. At Manila however he found great difficulty in getting his project attended to; in addition to the want of funds, and want of followers, he was opposed on a nautical ground sufficiently curious. At that time the fact of the N.E. Trade wind blowing at the Marianas nearly all the year round was known, and it was said at the Philippine islands that "a ship making the voyage to Mexico could not approach the Ladrões on account of the wind being foul." It was feared that if she did go there provisions and water would fail her. Nevertheless by sheer perseverance the PADRE SANVITORES managed to obtain from PHILIP IV. a royal mandate, dated 24th June, 1665, that a mission should proceed from the Philippines to preach the gospel to the Ladronian islanders, and that a vessel and all necessary assistance should be provided for that purpose. The governor of the Philippines, DON DIEGO SALCEDO, had a vessel built at Cavite (called a ship by historians), and named the *San Diego*, in order to convey the missionaries and their establishment to the islands. The *San Diego* sailed from Cavite on the 7th of August, 1667; arrived at Acapulco in the beginning of January, 1668; sailed again on the 23rd of March; and at length made her appearance before Agaña on the 16th of June following,—after a voyage of more than ten months.

This was the first expedition from the Philippines to the Marianas of which there is any record, and it is no doubt the first that was ever made. It will be observed as remarkable that the voyage was made by touching first at Acapulco; but the curious thing is that the same track was followed for a considerable length of time, and even up to the time of Spain losing her American colonies. Whenever a vessel sailed from Manila for the Marianas, she first went to Acapulco,—both goods and passengers thus making a circuitous track of 5000 leagues before reaching their destination. However extraordinary this may now appear, the fact is undoubtedly

true that from the voyage of the *San Diego* the same track was followed by every vessel up to the end of the last century.

When PADRE SANVITORES and his coadjutors arrived at the Marianas the population was considerable; some set it down at 100,000, others at 70,000, and the most moderate, at 40,000. The Padre, in his letters, says that in the first year he baptized 50,000 persons, and mentions 180 towns and villages in the island of Guajan alone. The whole of these places have disappeared, but their names are preserved in the localities where they stood, and which are now waste with brambles. Possibly, the accounts which the missionaries have left may be exaggerated, but the numerous graves found at every step, not only in Guajan, but in all the other islands of the archipelago,—the caves full of human skulls,—nearly all parts of the islands cleared,—and the circumstance of the cocoanut tree growing in the most out-of-the-way places, which within the tropics is the sure sign of the existence of man, barbarous or semi-barbarous—this tree always marking his footsteps,—these are all proofs that there was a very large population in the Marianas at the time of their discovery.

It is not necessary to dwell on the history of the reduction of the islands; suffice it to say that soon after the arrival of the mission the natives rose against it, although it had been received at first with every mark of welcome. The Padre—a well-informed and exemplary man, full of benevolence towards the natives and zeal for his calling—was probably the real cause of the uprising. He commenced by baptizing the young Indians by force, and against the desire of their parents, who believed that the water which he used in the ceremony was poisoned, and that their children died from the effects of it. This belief rose from the fact of the missionaries giving preference, in performing the ceremony, to sick persons and to weakly or sick children. The result was a general rising of the whole population. The PADRE SANVITORES was killed in the act of baptizing a little child; but his memory is still cherished in the Marianas as that of a saint.

Various other missionaries met the same fate as the PADRE SANVITORES, dying under the hands of the natives, and the few Spaniards in the Marianas were reduced to the last extremity. It happened about this time that a squadron of ships touched at Umata on their voyage from Mexico to the Philippines, and the commander-in-chief nominated a governor to the islands, who was left on shore, with some soldiers, to re-establish order.

The first governor of the Marianas adopted such summary measures that in a very short time he pacified the country. He killed, burnt, and destroyed people, provisions, and produce of every kind; he carried fire and sword everywhere, instead of kindness and conciliation; and the devastation was only terminated with the blood of the natives and on the ashes of their dwellings. Driven from the island of Guajan (Guam), they were hunted to and from islands throughout the whole archipelago. A dreadful famine, followed by an epidemic, finished the work which had been begun in slaughter; peace reigned in the new colony, but it was destitute of population.

It is a sad but a true picture; and such, in brief, is the history of the Marianas, related in plain terms and in pretty words by the Jesuit Fathers, and published in Madrid (according to law) in the latter years of the seventeenth century, in the reign of CHARLES II., called the Hechizado.

The population, which in 1668 was so numerous, was reduced in 1710 to 3539;

and it was decreasing, for in 1722 it was only 1936. From that time it increased a little; in 1800 it was 4060; in 1818 it reached 5406; and in 1849 it had risen to 8709. In 1856 it was 9500, but a virulent epidemic in that year carried off half the population of the islands, leaving only 4556 persons. In 1864 the inhabitants of the whole archipelago numbered 5595, distributed as follows;—

In GUAJAN island . .	Agaña . . . . .	} 4049	
	Pago . . . . .		
	Sinajaña . . . . .		
	Anigua . . . . .		
	Asan . . . . .		
	Tepungan . . . . .		
	Agat . . . . .		202
	Sumai . . . . .		176
	Merizo . . . . .		146
	Umata . . . . .		110
	Inarajan . . . . .		126
			—4809
In ROTA island . . .	Rota . . . . .		335
„ TINIAN „ . . .	Sunharon . . . . .		18
„ SAIPAN „ . . .	Garapan . . . . .		433
Total . . . . .			5595

The indigenous natives, called *Indios Chamorros*, are very much like the *Tagalos* and *Visagos* of the Philippine islands, although of a somewhat better constitution. The inhabitants of Saipan, who came from the Caroline islands, are a robust and vigorous class. The *Chamorros* are more indolent than the natives of the Philippines; but not so the Caroline islanders,—who are naturally active, industrious, and hardworking.

As a general rule the *Chamorros* are much like the Indians of other parts of the world; idleness is their leading characteristic; but this defect is amply compensated by virtues of no small importance, among which soberness and generosity occupy a prominent position. Idleness is, perhaps, as much the inherent nature of the Indian as the colour of his skin; but it may be the effect of the fertility of the soil where he is born.

There are many curious monuments in the Marianas, different from those in other islands of the Pacific, with perhaps the exception of some in Easter island, in the South Pacific. They are to be seen in Guajan, Rota, Tinian, and Saipan. Those in Tinian being superior in character to the rest, it may not be out of place to give a brief description of them. At a short distance from the landing-place of Sunharon, about a dozen quadrangular columns are ranged in two lines; the bases of the columns are pyramidal, and vary slightly from each other. The columns are 14 feet high, 6 feet wide at the base, tapering to 3½ feet at the top; and each is surmounted by a solid hemisphere 6½ feet in diameter, the plane surface being uppermost. The materials used in the construction appear to be a composition

of chalk and sand, but so hard that it might be mistaken for stone. Each column is formed of a single piece, but in the hemispheres several pieces appear to have been cemented together. Of the twelve columns, forming two regular lines, five have fallen down, but so hard are they that they are not otherwise broken, and only two have lost the hemispherical top. FRETCHET thought that these singular constructions might have been the abodes of the chiefs of the early inhabitants of the islands, but the commander of the *Narvaez* rightly demurs to this view, inasmuch as the natives call them the "Houses of the Ancients"—not in the sense of dwellings but as places of sepulture. The native tradition respecting the house at Sunharon is that TAGA, the daughter of a Timian king, who lived long before the discovery of the islands, was buried there in rice-flour. DON FELIPE DE LA CORTE, a governor of the Marianas, has examined the columns to test the truth of the tradition; all appeared to be solid with the exception of one hemisphere, in which was a cavity,  $4\frac{1}{2}$  feet by 2 feet, coffin shaped, full of earth, and in which a small shrub had taken root; he also found a jawbone with two teeth in it, and two finger joints; all apparently belonging to an adult.

The similar buildings in the other islands are of stone, but not more than 4 to  $4\frac{1}{2}$  feet high. At Asan, near Agaña in Guajan, there are six such ruins; under some human remains buried in a sitting posture were found, as was the custom among the ancient Peruvians, and as is still practised in Japan. The natives regard these relics with superstitious fear.

**Winds.**—According to DON LUIS DE TORRES, the season of bad weather—of thunder, rain, and storms—begins in July and lasts till November; the winds vary from N.W. to S.W., sometimes from south to S.E., generally, however, between north and west. During December, January, and February, the weather is variable. March, April, May, and June are the finest months.

Hurricanes are occasionally experienced; but earthquakes are tolerably frequent. (See also p. 7 of "Notes on the Winds and Currents of the Pacific Ocean.")

**Currents.**—The Marianas being situated near the outer limit of the Monsoon-region, the currents are variable—generally, however, following the direction of the wind; sometimes a current has been experienced running counter to the wind.

The Marianas were visited and described by most of the early navigators,—by ANSON, DAMPIER, COOK, WALLIS, PORTLOCK, VANCOUVER, KOTZEBUE &c., but their account is in a measure superseded by that of the D. EUGENIO SANCHEZ Y ZAYAS, Commander of the Spanish corvette *Narvaez*.

**GUAJAN** (heretofore written GUAM and GUAHAN), the largest, the most important, and the most populous of the Marianas, lies between lat.  $13^{\circ} 13'$  and  $13^{\circ} 39\frac{1}{2}'$  N., and between long.  $144^{\circ} 37'$  and  $144^{\circ} 57'$  E. It is the residence of the authorities, and of the few Spanish inhabitants of the archipelago.

Guajan is 27 miles long (N.N.E. and S.S.W.), and its greatest breadth is from 10 to 11 miles; but its contour is so irregular that in one part it is only 3 miles across. The northern part is generally low, and here the small hill of Santa Rosa is the only elevated spot; but to the southward it is rather mountainous, more irregular and broken in outline, and tolerably high.

DAMPIER (1686) speaking of this island, says :—" At a distance it appears flat and even, but coming near it, you will find it stands shelving ; and the east side (which is much the highest) is fenced with steep rocks that oppose the violence of the sea which continually rages against it, being driven by the constant Trade wind, and on that side there is no anchoring. The west side is pretty low, and full of small sandy bays, divided with as many rocky points."

The whole island is cleared, and wood is not very abundant : the soil, which is very fertile, is susceptible of culture to the highest summit ; but from want of hands the produce is rarely more than a few articles required as food by the Indians. Nothing is exported ; and nearly all that is planted is consumed. Each family has its small plot of ground for the cultivation of rice, plantains, and yams,—necessaries for the requirements of existence. Breadfruit and sago grow spontaneously everywhere ; and these are all the natives of Guajan seem to desire. Having no imports or exports, their beautiful grounds, which anywhere else would be a mine of riches, remain entirely unproductive.

As might be expected, there are no rivers in so small an island ; but there is an infinity of brooks and rivulets, due to copious rain. In fact, in these islands a great quantity of rain falls, although it may be said there are no wet and dry seasons. It rains every day, and frequently in torrents. The enormous evaporation of the Pacific suspended in the atmosphere becomes condensed as it passes over the islands, and as a consequence it rains with all winds and at all times. The *Narvaez* was there in December and January—the dry season—and it was very rare that it did not rain most plentifully every day.

The climate is very refreshing, and generally much cooler than that of the Philippines ; but the natives say that in August and September the heat is suffocating. This must arise from the interruption of the general N.E. Trade wind, which blows here all the year round excepting in those months when the influence of the S.W. monsoon of the China Sea is felt at the Marianas. At this season calms are common, for the Monsoon has not sufficient strength to reach them effectually ; it is also the season of storms and hurricanes.

**Agaña.**—This town, which bears the exalted name of city, and which partakes of all the privileges of the title, is in reality no more than a moderate sized place of 3500 inhabitants,—which is the greater part of the population of Guajan, and consequently of the Marianas. The majority of the houses are merely Indian cabins, built of wood and thatched with cocoanut leaves. There are, however, a few stone buildings, the most notable being those of the governor, the artillery barracks, the church, and the college. The last of these, erected in 1673, was the first house built in the islands ; it was established for the instruction of the natives, and has well answered the object of its founders, for the *Chamorros* at least, although they have not lost their own primitive language, all speak and understand Spanish,—a qualification which none of the *Tagalos* and *Visagos* of the Philippine Islands can boast. The artillery barrack is a spacious handsome building, but nearly empty. The church contains nothing remarkable ; and the governor's house is very good and commodious, although by no means spacious.

Agaña is built close to the sea-shore—on the south side of an open bay of the same name ; the streets are wide and clean, and are laid out in straight lines ; there is a

police; and the people are generally quiet and orderly, but indolent in the extreme, and not unfrequently dirty; with few exceptions the houses are built of bamboos and thatched with coconut leaves,—the occupiers being the builders.

A large number of the half-breeds of Agaña have a remarkable physical peculiarity;—they are copper-coloured, and have excessively red hair. The mingling of the native race with the Anglo-Saxon has no doubt produced this variety, and the number of these people is very considerable, due no doubt to the great number of whalers which frequent the islands, the seamen of which are Anglo-Americans.

AGAÑA BAY is included between Apuequam point on the N.E. (off which is the islet of Alupan), and point Diablo on the west; the shore is a sandy beach; but the bay is exposed, being without any shelter whatever from the wind and sea. The coral reef fringing the shore is a complete wall, and so limited is the space where the lead finds bottom that even a small ship would have no room to swing at her anchor. To communicate with Agaña a vessel must consequently either stand off and on, or must bring up at the port of San Luis de Apra, some miles to the westward.

Punta del Diablo—the point Adeloup of DUPERREY—is a conspicuous projecting rock, and has received its name from the extreme rapidity of the current in its vicinity, which makes it difficult to be doubled.

At the distance of  $1\frac{1}{2}$  miles W. by S. from point Diablo is the perpendicular rocky point of Asan, off which is the islet of Gapan; to the eastward of this headland is the village of Asan. Thence the coast trends W.S.W.-ly for the distance of  $1\frac{1}{2}$  miles to the eastern point of the harbour of San Luis de Apra. The steep reef already mentioned in connexion with Agaña is continuous to the entrance to this bay.

**San Luis de Apra.**—The harbour of San Luis de Apra is protected towards the north by the island of Apapa or Cabras, contiguous to which (on the west) is the Luminta reef; on the N.W. is the Calalan bank; and on the S.W. is the narrow and rocky peninsula of Orote, which is projected from the coast in a N.W. by W. direction for the distance of  $3\frac{1}{2}$  miles. The extremity of the peninsula is named point Orote, and off it there is a small islet also called Orote. The harbour side of the peninsula trends, first E. by S., and then S.E. by S., to the site of the village of Apra situated on the isthmus connecting the peninsula with the main land; thence the shore bends round to the east and north, forming a deep indentation in the shape of the letter V, which is fronted seaward by the island and reefs just mentioned. Cabras island is of coral formation, low, and



overgrown with bushes; and coming from the northward it appears to be connected with the main land. The mountains stretching S.W.-ward from Agaña at the back of the harbour of Apra are called Tiniquio.

There is a good and deep channel of 21 fathoms,  $\frac{1}{2}$  of a mile wide, between Orote isle and the S.W. extreme of Calalan bank; but this end of the bank must not be approached too close, as there is a shoal spot on it—the *Piedras de la Fragata Española*—on which a richly-laden Spanish galleon was lost; it lies about  $\frac{1}{2}$  a mile from the Orote shore,—towards which shore, therefore, it is necessary to borrow. A small vessel may pass over the bank in from  $4\frac{1}{2}$  to  $5\frac{1}{2}$  fathoms water, but it is probably unsafe unless buoyed; it is certainly dangerous in bad weather and with any sea on, as there are many rocky heads on it; otherwise the water is so transparent that the bottom and the rocks are always visible, and the latter can be avoided. The corvette *Narvaez* invariably passed over the bank, but in spite of only drawing 14 feet, there were times when the commander regretted doing so, fearing he might touch or run on a rock, and then be struck by a following sea.

Once inside the harbour, it is extensive and safe, but much encumbered with islets, rocks, and banks; the water, however, is smooth.

There are a dozen or more coral banks between which anchorage may be found in from 18 to 23 fathoms water. Westward of the meridian of the west point of Cabras island the depth is considerable and the ground rocky, eastward of that meridian the bottom is sandy and holds well.

Inside the harbour, on an islet level with the water, stands the small fort of Santa Cruz. There is anchorage at about 2 cables north of the fort, in from 5 to 15 fathoms water, muddy bottom, surrounded by coral patches but 2 or 3 feet below the water; the channels leading thither are very narrow in places, but the patches are generally steep-to. It is frequently necessary to warp in. The *Narvaez* found the best anchorage south of Cabras island, and 1 mile from the fort of Santa Cruz, where the commander states there is more shelter, and more convenience for communicating with Agaña.

*Position*.—The fort of Santa Cruz is in lat.  $13^{\circ} 25' 45''$  N., long.  $144^{\circ} 39\frac{1}{2}'$  E.—Orote point is in lat.  $13^{\circ} 26'$  N., long.  $144^{\circ} 37'$  E. (Spanish chart, 1865).

Landing at the port of Apra is very inconvenient. The shore is everywhere fringed with reefs which extend out some distance from it,—alternately rocky heads and deep holes, the former having so little water over them that at low tide the smallest boat cannot land for them; hence all communication with the shore is very difficult even in the smallest boats, as may be seen when the tide is out; the channels are also so intricate between the rocks that a boat, and that not a large one, has been four hours pulling from the beach to the vessel, a distance of about a mile.

The *watering place* is a small river that falls into the harbour about a mile from the fort of Santa Cruz. The boats are despatched at high water; the casks are filled at low water, and brought off again at high water.

From point Piti (behind Cabras island) to Agaña the road is good, and the only one on the island, excepting that from Sumai to Agat. The point is a long league from the city, and there are no means of communication between them—unless a vehicle be sent from Agaña; you must either walk, or take a bullock, which does a horse's duty here; but no one cares for walking a journey in the heat of the sun in latitude  $13^{\circ}$ .

Besides Agaña there are ten villages in Guajan, but they are poor places, in which no Spaniard or European, save the padre, is to be found. In fact they are as unimportant as their population is small, there being but three parishes for *curés* in the island besides Agaña; one at Agat, including Samai; another at Inarajan; and a third at Merizo, to which Umata is attached. The other villages (called Pago, Sinajaña, Anigua, Asan, and Tepungan) are visited by the *curé* of Agaña, and so small are they that the whole five do not muster 81 cane huts, occupied by as many families of fishermen or labourers.

Old charts of the island (those of DUPERRY and CORLLO) show other places, such as at Apra, in the bottom of the port of that name; at Ajayan in the southern part of the island, Tarofso and Ilic on the eastern coast, &c. But these disappeared in 1856, when a virulent epidemic visited the islands. The want of medical assistance (for there is only one doctor to all the islands) and of medicines, and the absence of all resources whatever, allowed the sickness to take its own course, and in a short time it carried off half the people. There are parts where not a single inhabitant was left; and the towns have entirely disappeared; thus where Apra stood not a single hut remains, nor anything to indicate that it had been a populous place.

**SUMAI.**—The village of Sumai stands on the west side of the beach in the port of Apra. It is the general resort of the crews of any vessels lying there, for Agaña is too far, and thus Sumai reckons 29 houses of tolerable appearance, and the inhabitants are more accommodating than those of other parts of the island.

**AGAT** is at present the most important place next to Agaña; it contains 36 native houses, besides one of stone in which the *curé* resides; and there is a poor church. The village is situated close to that part of the coast whence the peninsula of Orote commences to stretch towards the N.W.-ward,—at the head of an open bay 6 miles wide, formed between Orote and Facpi points. On the reef fronting the village are two or three rocky islets. From Agat the coast trends S.S.W. for the distance of 4 miles to point Facpi, but landing is impracticable. To the S.W.-ward of Agat, at the distance of 2 miles, is an islet called Alupan or Alutumg, connected with the shore by the reef, and  $\frac{1}{2}$  a mile off a projecting point near which are several rocks;  $1\frac{1}{2}$  miles still further southward is another islet (Anaya), which, however, is detached from the shore-reef.

Point **Facpi** is a prominent headland terminating in an isolated rock joined to the shore by a reef, uncovered at low water, in lat.  $13^{\circ} 20' 50''$  N. From point Facpi the coast trends irregularly to the S.E. for the distance of 2 miles to **Cetti** bay, which is nearly as large as that of Umata, but little is known of it.

**Umata**, from old association, is the port of most repute in the Marianas. Ships from Mexico bound to the Philippines always touched here for water, and to leave gold for the colony; on such occasions the governor repaired thither with all the good society of Agaña, and there transacted all the business of the islands. Thus Umata was at once the arsenal of the islands, its port of commerce, and the main source from which the archipelago derived importance. The ships used to lie there two or three months, placing their valuable cargoes in store, in the governor's house, in an enormous wooden chest which is still preserved; repairs were executed; and the time was passed in feasting and dancing. But those days, unfortunately for

Umata, have fled. The flotillas of Mexico and Peru no longer touch at its port; the famous Acapulco galleons, laden with treasure, have disappeared; the print of the sailors' feet is no longer seen on the strand, nor their songs heard in the deserted town. Instead of the harbour being crowded with shipping, a solitary whaler is occasionally seen here; rushes grow on the banks of the river where formerly the tents of the visitors were pitched, and Umata has gradually gone to utter decay.

The bay, which is 3 miles to the southward of point Facpi, and 4 miles northward of Cocos island (at the S.W. extremity of Guajan), is small, being less than  $\frac{1}{4}$  of a mile, east and west, while the width at entrance is less than 3 cables; the depth in the centre is sufficient for the largest vessel, but the area of anchorage, owing to the reefs fringing the shore, is very limited (about 2 cables by 1 cable); consequently it is only adapted for vessels of light draft. The usual place of bringing up is in the roads, which is scarcely more than the open coast-line of the island; here there is sufficiently good shelter during the prevalence of the N.E. Trade wind; but in the season of westerly winds, from June to September, it is scarcely possible, nor prudent if possible, to anchor either in the roads or the bay, owing to the exceedingly heavy swell that then sets on the coast.

The entrance to Umata bay, in lat.  $13^{\circ} 17' N.$ , is between two conspicuous forts; that of San Angel on the north, with San Jose on the coast still further north; and that of Nuestra Señora de la Soledad on the south side of entrance; both forts stand on rocks, with reefs projecting seawards from their base; the rounded headland stretching from the hill on which La Soledad is built, is known as point Chalan Aniti, and thence to the southward and westward of it the land is low, forming a narrow belt, and having a reef projecting nearly  $1\frac{1}{2}$  cables from it to the westward, and called point Machadgan (or Tougouene).

The southern shore of the bay is mountainous, Monte de Inago being a conspicuous object. At the head of the bay the river Umata sometimes flows to the sea, at other times loses itself in a swamp. Near the river is the old church; and the town (or what remains of it) stands on the north side of the bay, where it is generally low, with an amphitheatre of inconspicuous hills rising behind it.

The ANCHORAGE given on the chart is with fort San Angel bearing N.N.E.  $\frac{1}{2}$  E. and fort Soledad S.E. by E.  $\frac{1}{4}$  E., in  $7\frac{1}{2}$  fathoms, bottom of sand and shells. (Var.  $2^{\circ}$  E.)

Good water may be procured from a rivulet flowing between mount Inago and the hill on which fort Soledad is built.

The present village of Umata is a wretched place, of about a dozen Indian huts, and a small church, besides the governor's house. Both the latter buildings contain a stone on which is an inscription commemorating the effects of a tremendous earthquake on the 25th of January, 1849, when the palace was destroyed. Amidst the ruins is the dwelling of a native who performs the duties of port captain. The present roof of the church is formed of cocoanut leaves, and there remain the four walls and the steps of the altar, with a few badly-carved images. The *curé* resides at Merizo, and thither the people from Umata go to attend mass.

Looking at the plan of Umata it appears to be a well-fortified place: there are the forts of San José, San Angel, and La Soledad, and the battery of Carmen, a tolerable number of respectable fortifications, *on paper*, and you may suppose them to be bristling with cannon, with sentries pacing the walls, and the national flag

waving over one of the bastions; but there is generally a difference between imagination and reality, and the Marianas are no exception to the general rule; those castles are twin brothers to what may be seen at San Luis de Apra:—they are all small affairs, and they have not a single piece of mounted artillery. The positions no doubt were well chosen, but the buildings are fast falling to pieces.

It has been observed that the roadstead of Umata is nothing more than the open coast-line of the island, under shelter of which vessels may anchor during the prevalence of N.E. winds. But bottom is readily found, and a vessel may anchor off any part of the coast from point Orote to the vicinity of Merizo. Off Agat there is better anchorage, and more shelter from the sea, owing to the position of point Orote; besides which the sea never comes from the northward excepting in the summer months; in the latter season, when the influence of the S.W. monsoon is felt at the Marianas, it is absolutely dangerous to approach the coast, except at Apra, owing to the heavy sea which gets up, and the generally rocky and bad holding ground.

Notwithstanding that the anchorage off Agat is better than that off Umata, the latter roadstead is always preferable, for the coast-line about Agat is bounded by reefs, landing is very difficult, and water consequently cannot be obtained. Umata has not these inconveniences; water is obtained there with the utmost facility, and thither the small vessels frequenting the Marianas go.

**MERIZO.**—The town of Merizo is about  $1\frac{1}{2}$  miles southward from Umata; it contains 32 houses and 146 inhabitants. The houses, which are the worst in the islands, are narrow, low, dirty, and bad in every sense of the word. The people attribute this to a scarcity of wood, but the *curé* considers that the fault lies in their own laziness, for at a short distance from the town there is an abundance of trees;—but the natives in the southern part of Guajan are decidedly more lazy and listless than those to the northward. The church, which was built in 1779, was burnt in 1858, and in three years afterwards was rebuilt, the old walls serving, with a thatch of cocoanut leaves. The only habitable house here is that of the *curé*.

A few very small vessels may anchor in the vicinity of Merizo, in a narrow channel formed in the reef.

The natives at the south end of Guajan labour under the disease of leprosy. Umata, Inarajan, and Merizo are full of lepers.

**SOUTH COAST.**—*Reef and islets.*—The southern extremity of Guajan is a sandy beach fronted by a reef, which stretches  $2\frac{1}{2}$  miles seawards opposite Merizo, and gradually contracts in breadth as it approaches the S.E. point of the island; its southernmost limit is in lat.  $13^{\circ} 13' N.$ , in long.  $144^{\circ} 39' E.$  Over the reef there are several narrow channels, and in one (Canal de Mamanoé) near Merizo small vessels may anchor, but for a brief period. On the south-westernmost part of the reef are the low sandy islets of Bali and Cocos,—the latter 1 mile long in a N.E. and S.W. direction, but being frequently washed over by the sea and by heavy breakers during great gales, the configuration is uncertain. All this part of Guajan is dangerous, and vessels should approach it with great caution. There are several small islets scattered here and there on the reef.

Point AJAYAN, in lat.  $13^{\circ} 14' N.$ , long.  $144^{\circ} 44' E.$ , is the S.E. point of the island; immediately westward of it is the small bay of Ajayan, which is much obstructed by reefs and consequently unapproachable when there is any sea on.

AGFAYAN BAY,  $2\frac{1}{4}$  miles to the northward of point Ajayan, is open to E.N.E.; it is small, but is said to have anchorage for vessels drawing less than 15 feet. There is a small brook at the upper end, where boats can easily obtain water. Between the bay and point Ajayan the reef extends in places  $\frac{1}{2}$  a mile from the coast.

INARAJAN BAY.—From Agfayan bay the coast trends to the N.E.-ward, and at the distance of  $\frac{3}{4}$  of a mile is Inarajan bay, a tolerably good harbour a  $\frac{1}{2}$  of a mile wide at the entrance, and extending inland more than  $\frac{1}{2}$  a mile; but the reef fringing the shore greatly contracts the anchorage; being on the east side of the island, and open to the S.E. a vessel would be safe here during westerly winds, but not during N.E. winds—which send a heavy sea into the bay. The coast between Agfayan and Inarajan is fronted by a narrow reef on which are several small islets. The village on the S.W. side of the bay contains 21 native huts, the *curé's* house, a church, and 126 inhabitants. At the head of the bay are several rivulets.

ULOMNIA, a mile to the N.E.-ward of Inarajan, is a small bay fit only for boats.

TAROFOSO.—Nearly  $1\frac{1}{2}$  miles to the northward of Ulomnia is the harbour of Tarofoso. It is less than a  $\frac{1}{2}$  of a mile wide at the entrance, and extends about  $\frac{1}{2}$  a mile W.  $\frac{1}{2}$  N. and E.  $\frac{1}{2}$  S. If a vessel maintains a proper distance from the shore there are neither reefs nor rocks in the way, and next to Apra it is the only place on the island where there is anchorage at all seasons of the year in from 5 to 8 fathoms. On the south side, near the entrance, is a small inlet called Piacpouc bay; and still further in is the still smaller inlet of Gayloup. On each side of the harbour the hills are steep and descend almost abruptly to the shore, entirely sheltering it from all winds except those between N.E. and S.E. The Tarofoso river is the largest in Guajan. There is no village here. A point at the head of the harbour on the south side of the sandy beach is in lat.  $13^{\circ} 18' 9'' N.$ , long.  $144^{\circ} 46\frac{1}{2}' E.$

ILIC BAY,  $4\frac{1}{2}$  miles northward from Tarofoso, is merely an exposed inward curvature of the coast, with a boat channel through the reef.

PAGO BAY, nearly 2 miles to the northward of Ilic, is another exposed, open bay, in lat.  $13^{\circ} 24\frac{1}{2}' N.$ ; it is only fit for boats and small vessels; there is a village of a few huts here.

Between Pago and point Este de Patai—the N.E. point of the island—the coast is rugged and steep; and there is no shelter on any part of the east side of Guajan, northward of Tarofoso, during the prevalence of the N.E. monsoon.

NORTH COAST.—From point Este de Patai the coast trends  $1\frac{1}{2}$  miles to the N.W.-ward to point Norte de Patai—still rugged, bold and steep; thence the hills fall back a little, and the land near the coast is low and fringed with reefs as far as and round point Ritidian, where the coast is again steep. Point Ritidian—the northernmost point of Guajan—is in lat.  $13^{\circ} 39' N.$ , long.  $144^{\circ} 52' E.$

That portion of the western coast of the island between point Ritidian and Agaña is alternately low and bold,—with many conspicuous projecting points. In lat.

13° 36½' N. is the exposed anchorage of **Falcona**; and a little to the northward of the roadstead of **Agaña**, between points **Amautes** and **Tumun**, is **Tumun** bay, in lat. 13° 30½' N., which, though full of reefs, has several passages where boats can enter and land without difficulty; here stood the village of **Gnatun**, near which the **Padre SANVITORES** was killed.

**PRODUCE AND SUPPLIES**.—The produce of **Guajan** consists of maize, rice, various kinds of pepper, yams, potatoes, tobacco, betel, garlic, onions, &c.; the fruits are plantains, cocoa-nuts, bread-fruit, pine-apples, melons, oranges, limes, tamarinds, mangoes, &c. The small farmers breed cattle, pigs, fowls, ducks, turkeys, and peafowl. The wild birds are numerous and of great varieties. Fish is plentiful on the reefs near the coast, but sharks abound everywhere. The rivers contain trout, barbel, and eels. The only noxious animals are the centipede and the scorpion; snakes are unknown. There are no alligators in the rivers, but there are iguanas.

Small streams, rivulets, and brooks are sufficiently abundant, and there is no lack of water. There are roads from **Agaña** to most of the villages and bays, but they sadly want repair; they have been good at one period of the history of the island, and so were the bridges that span the streams, but they have now gone to decay.

The most elevated parts of the island are visible from the distance of 25 to 30 miles. **Santa Rosa**, in the N.E., is 6 miles from **Agaña**; mount **Lamlan**, on the western shore, is 7 miles. Mount **Ilichu** overlooks **Umata**, and on it there is a station whence passing and approaching vessels may be seen at a considerable distance.

The channel between **Guajan** and **Rota** (the next island) is 30 miles wide, and devoid of danger.

**ROTA** island, called by the natives **LUTA**, and frequently misnamed **Sarpan** and **Zarpene**, lies N.N.E. ¼ E. from **Guajan**: it is 12 miles long (N.E. by E. and S.W. by W.), and about 6 miles wide in its broadest part, but tapers off to about ¾ of a mile opposite the two anchorages near its W.S.W. extremity. Its highest part is about 600 feet above the sea, and the mass of the island is more hilly than **Guajan**.

*Position*.—The summit of **Rota** is in lat. 14° 7½' N., long. 145° 13' E.

The mountain forming the island is flat topped, and a volcanic crater is said to exist at the summit; this, however, cannot have been active for several centuries, since trees and a thick, almost impenetrable, undergrowth of bushes flourish on all sides to the topmost heights. Numerous monuments of rudely wrought stone scattered on the mountain slopes appear to mark the burial-places of a people that inhabited the island not only before the Spanish conquest, but before the **Chamorros** occupied it.

The south and S.E. sides of the mountain are steep, and the coast in those directions tolerably high, and in places perpendicular; two bold and conspicuous points are projected towards the south; in other parts the land descends gradually to the sea. Near the W.S.W. end, at the base of the mountain, there is a long, narrow, low, sandy flat, terminating more to the S.W., in a high promontory called **Taipingon** point; and on this flat or isthmus is a town or rather village, consisting of two streets, off either of which there is anchorage.

The village of **Rota** contains about eighty houses and huts, built of cane and thatched with cocoa-nut leaves, in the midst of which is a stone church (also

thatched), the *curé's* dwelling, and the *casa real* or official residence; many of the houses are built on piles of tolerable height, otherwise they would be washed away. Of the 335 inhabitants the *curé* is the only European. The two streets forming the village are named respectively Sosanlago and Sosanjaya, each of them fronting a beach, and giving its name to an anchorage,—Sosanlago being that to the north-westward, and Sosanjaya that to the south-eastward. The isthmus on which the village stands is so low that the sea washes over a large part of it in bad weather; on such occasions the inhabitants seek refuge in a cave on the more elevated ground near Sosanjaya, and when the storm has passed over return to their huts. The cave is a very remarkable one—abounding in stalactites, stalagmites, crystallizations of various kinds, and large pools of deep water—and its limits are unknown. The natives are poor, and their usual occupation is fishing.

**PRODUCTIONS.**—The natives rear pigs and poultry, and cultivate rice, maize, corn, yams, and various kinds of vegetables; they also make cocoa-nut oil. Cocoa-nuts, bread-fruit, plantains, oranges, &c., are the natural fruit of the island. The surplus produce is generally exchanged at Guajan for whatever necessities may be required; but passing vessels can always procure supplies for money, or in exchange for clothes, tools, nails, &c.

**WATER.**—There is a deficiency of good drinking water; that used by the natives, taken from some open wells in the village, is either stagnant or brackish, but better may be procured from a brook which is  $1\frac{1}{2}$  leagues distant from the anchorage.

**Anchorage.**—The commander of the *Narvaez* says that “the anchorage of Sosanlago—the N.W. side of Rota—is very bad,—indeed, the worst in the whole Marianas; it is confined to a limited area on the reef fringing the shore, but so near the breakers that a vessel is scarcely safe; the bottom is rocky, with patches of sand here and there; the depth of water is so irregular that I have found 13 fathoms at the chains, though the anchor was dropped in 28 fathoms. The pilot informed me that these holes are common,—as, indeed, must be the case, for the bottom is coral all round the island.

“The anchorage of Sosanjaya—to the S.E.—is as bad as that to the N.W., with this difference, that the shore is rocky and cannot be approached; consequently when wishing to land from a vessel anchored off Sosanjaya, it will be necessary to double Taipinson point—making a circuit of 3 miles—and bring the boat to Sosanlago, where there is a sandy beach. Nevertheless, Sosanjaya affords the best shelter from N.E. winds, and is less exposed to heavy seas resulting from bad weather with the wind in that quarter.

“Taipinson point being precipitous and bold close-to, may be approached with safety within reasonable distance; but great care is required in making for the anchorages,—the lead must be kept going, and the anchor dropped in 13 to 17 fathoms. The channels through the reefs, to the anchorage, require the assistance of a pilot.”

**AGUIGAN** island lies N.N.E., distant 42 miles from Rota,—the channel between being perfectly safe. Aguigan is little more than a large rock, 3 miles long and  $\frac{1}{2}$  a mile wide, very high and precipitous, and consequently difficult of access. The only landing-place is on a slope towards the N.W. side, and even this cannot be

approached unless the weather is fine; everywhere else the coast consists of vertical rocks more than 50 feet in height. It is uninhabited.

The soil is rocky and sterile, and hence the island has a barren appearance; but an undergrowth of briars, ferns, &c., such as flourish in the tropics, is common enough, and towards the summit of the island a few cocoa-nut trees seem to thrive. Large crabs abound near the shore, and are said to attack any one who lies down to sleep.

The vicinity of Aguigan is safe and devoid of dangers, except on the S.W. side, where, at less than a mile from the shore, there are three perpendicular rocks of small size; they are connected with each other, and between them and the island there is apparently deep water.

This is the last island of the Marianas group of which the Spaniards took possession. The natives who escaped from the other islands sought refuge here, and fortified the only landing-place; and the Spaniards, after several unavailing attacks, were compelled to haul their vessels alongside the perpendicular coast, and land from the yard-arms.

**TINIAN** island, 5 miles to the N.N.E.-ward of Aguigan, was celebrated in the last century for its fertility and for the abundance of its flocks. It was occasionally called Buenavista by the Spaniards.

Commodore ANSON, in his voyage round the world, arrived at Tinian, August 24th, 1742,—his crew suffering from scurvy, and the vessel, in fact, a moving hospital. Thanks to the fresh provisions and fruit which he obtained here in abundance,—cattle, pigs, fowls, plantains, oranges, cocoa-nuts, and bread-fruit,—the men were completely restored to health in a week: and the water casks were also replenished from the numerous springs of excellent water, or from the wells. He brought up in the harbour of Sunharon, which he called Anson road, and remained until the end of October, by which time the crew of the *Centurion* were sufficiently rested to prosecute their voyage.

ANSON spoke of the island in the most flattering terms,—describing it, in fact, as little less than an enchanted garden: this was natural, as the arrival thither of the *Centurion* had been so opportune, that but for that the entire crew would have perished miserably from the effects of scurvy.

Guided by the report of ANSON, the expedition under LORD BYRON arrived at Tinian in 1763; but it was no longer what it had been; the lapse of twenty years had completely altered its very appearance; instead of a paradise it had become a wild, uncultivated island, over-run by brambles; there was but little water and that bad; the climate was insufferably hot; and flies, scorpions, ants, mosquitoes, and centipedes abounded. BYRON considered Tinian as the most unhealthy place he had ever visited.

WALLIS, who called at Tinian in 1767, speaks of it in terms even worse than BYRON did; but he admits procuring a sufficient supply of cattle, pigs, fowls, potatoes, limes, oranges, and bread-fruit,—indeed everything mentioned by ANSON; but the water was brackish and full of animal life; the climate bad, and the whole island overgrown by brambles.

GILBERT in 1788 spoke of the island as WALLIS had done; but a year later

MORTIMER gave a better account—refreshments were to be procured, but the cattle were wild and had to be hunted; the well near the anchorage which had been extolled by ANSON, greatly depreciated by BYRON, and found dry by GILBERT, was reported by MORTIMER as abounding in excellent water.

These very opposite views no doubt arose from the temper and disposition of the several navigators, and from the different circumstances under which the call was made at Tinian. ANSON and the crew of the *Centurion*—emaciated and dying—and after a long, tempestuous voyage, full of mishaps—would naturally see it under a very different aspect from that under which BYRON, WALLIS, and GILBERT saw it;—the conditions and situation were not alike; again, a well dry in August might be full in December, and a sky cloudy at one season may be bright at another.

Tinian, almost deserted in ANSON's time, and which still continues to be all but deserted, supported at an earlier date a large, and to some extent civilized population, as the numerous monuments on the island testify.

Tinian, 10 miles long (north and south) and from 4 to 5 miles wide, is generally low, and has no hills of any kind to mark it; that it is of volcanic origin is evident from the abundance of pumice, black sand, and scoræ. There is a small reef of rocks near the N.W. point, but the whole of the west side of the island is precipitous, except towards the S.W. where Sunharon is situated. The *Narvaez* in passing point Gurguan—the most westerly extreme—nearly touched it, but the commander recommends giving it a berth of at least  $\frac{1}{2}$  a mile, since the details of the coast are unknown. The eastern shore is even more precipitous than the western, and more exposed to the oceanic swell. It has been reported that a large bank exists about a mile to the eastward of point Lalo—the southernmost extremity of Tinian—but it was not found by the *Narvaez*;—a reef fringes the shore of the point, but is of less extent than shown by the chart, but the commander adds that more information is required respecting the north end of the island, and of the strait between it and Saipan to the N.E.-ward.

Sunharon, formerly called ANSON ROADS, is the only anchorage the island affords, and is as bad as can be conceived; it is an open roadstead on the S.W. side of the island,—close to Lalo point; or, more properly speaking, it is a point on the coast where bottom may be found, and the anchor dropped during the period of the N.E. monsoon. The bottom is of coral which in places projects upwards and is pointed; in the midst are patches of sand. From October to June, the fine season at the archipelago, while the N.E. wind is prevalent, vessels may lie at this anchorage; but in the four months from June to the middle of October, during the westerly monsoon, when the winds are variable and not unfrequently blow with great fury, there is no shelter whatever.

The reef fringing the shore is awash, but there is a good channel for boats.

WALTER, the narrator of ANSON's "Voyage," after describing the island in glowing terms, says:—"but the most important and formidable exception to this place remains still to be told; this is the inconvenience of the road, and the little security there is, in some seasons, for a ship at anchor. The only proper anchoring place for ships of burthen is at the S.W. end of the island; the peak of Saipan seen over the northern part of Tinian, and bearing N.N.E.  $\frac{1}{2}$  E., is a direction for readily finding it: the anchoring place is then 8 miles distant. Here the *Centurion*

anchored in 20 to 22 fathoms, about  $1\frac{1}{2}$  miles off the shore, opposite to a sandy bay. The bottom of this road is full of sharp-pointed coral rocks which, during four months of the year, render it a very unsafe anchorage. . . . What adds to the danger at these times is the excessive rapidity of the tide of flood which sets to the S.E., between this island and Aguigan. . . . This tide runs at first with a vast head and overfall of water, occasioning such a hollow and overgrown sea as is scarcely to be conceived, so that we were under the dreadful apprehension of being pooped by it, though we were a 60-gun ship. . . . I shall only add, that the anchoring bank is very shelving, and stretches along the S.W. end of the island, and is entirely free from shoals, except a reef of rocks, which is visible, and lies about  $\frac{1}{2}$  a mile from the shore, affording a narrow passage into a small sandy bay, which is the only place where boats can possibly land."

The *Narvaez* anchored tolerably close to the reefs— $\frac{1}{2}$  of a mile from the village—in 14 fathoms, bottom of sand and stones. The weather was beautiful, and the sea smooth: the pilot had selected the anchorage with great care, notwithstanding which, and the short time she was there (5 hours), the anchor came up with the stock broken; this well bespeaks the nature of the ground.

The well, so much praised by ANSON, and so much disparaged by the navigators who followed him, is at a short distance from the landing-place; it is not unlike other wells,—wide but not deep, and descended by stone steps. The only thing remarkable about it is its antiquity. The natives call it the "Well of the Ancients," and it was probably sunk by the same people whose burial-places are seen in all parts of the island.

The village of Sunharon consists of half a dozen houses, inhabited by 18 persons, who form the whole population of the island. These come from Agaña, and are changed every two years. They are employed by the governor in killing the wild cattle so numerous in Tinian; the flesh is dried in the sun, and called *tajoa* or *tasajo*; it is sent to Agaña for sale, and the money supports the leper hospital situated on the east side of the island.

Sunharon is the only part of Tinian where vessels can bring up and communicate with the shore. In all other directions the coast is bold and precipitous, and offers no anchorage whatever.

The position of Sunharon village, according to the Spanish chart (1865), is lat.  $14^{\circ} 59' 22''$  N., long.  $145^{\circ} 36' 20''$  E.;—DUPERRÉY made it  $7'$  more easterly.

Tinian is generally low and without any conspicuous mountain; the west coast is steep except where Sunharon stands, and Gurguan point—the most westerly point of the island—may be passed tolerably close. A reef extends a short distance off *Tagon-chara*, the N.W. end of Tinian. The east coast is even more abrupt than the west, and the sea beats on it with great violence. The south extremity is point Lalo, and to the eastward of it a large and dangerous shoal has been reported, but the commander of the *Narvaez* says it cannot extend far to seaward, and must be less than usually supposed, as he could not find it. Little is known of the north end.

A channel, not over 3 miles wide in its narrowest part, separates Tinian from Saipan, the next island to the northward; it is not known how far it would be safe for a vessel to pass through it now,—PORTLOCK did so in Nov. 1787.

**SAIPAN** or **Saypan** island, formerly supposed to be the largest of the Marianas, is in reality less than half the size of Guajan, being only 14 miles long (N.N.E. and S.S.W.), and 6 miles wide in its broadest part. It is moderately high, and may be recognised by its lofty peak, situated a little to the southward of the centre of the island. This peak, which is perfectly conical, is an extinct volcano, and its altitude has been estimated at 2000 feet, but it is doubtful whether it exceeds 1000: about 2 or 3 miles northward of it is another extinct crater, also of tolerable height.

Saipan must have been at one time thickly inhabited, judging from the extraordinary number of ruins and graves that are found in different parts of it. Some of the caves are still full of human skulls, and these, at the time when the Spaniards first visited the island, were objects of great care,—if not of worship. At the conquest of the Marianas the island was completely depopulated, and it remained uninhabited for many subsequent years. In 1810 some Americans established themselves on it—without permission from the governor—and founded a colony, or rather a place of call for vessels engaged in the whale fishery,—which is very good in its vicinity; but in 1815, with no small difficulty, they were compelled to remove.

About 1842 Saipan was colonized by natives from the Caroline islands who had come to Agaña, seeking a home in consequence of their own low island having been submerged. They stated that many had been drowned by the catastrophe; that they themselves had been saved by taking refuge in the tops of trees, and afterwards reaching their canoes had started off in search of another island. They were sent by the governor of the Marianas to Saipan, where for a short time they dwelt in the numerous caves of the island; but being instructed in the method of building, they speedily established a small town on the west side of Saipan; this is called Garapan, which in January, 1864, contained 433 inhabitants,—9 of whom were Chamorro Indians and 424 Carolinians. One of the Chamorros holds the office of *alcalde* (magistrate), and is the representative of the government: the duties are easy, as the Carolinians are docile and peaceable. They greatly respect old age; hence old men are always placed in positions of authority,—they settle all disputes, and from their decision there is no appeal. The shedding of human blood is regarded by all with the greatest horror, and since the establishment of the town of Garapan no such outrage has occurred. Simple and active, intelligent and anxious to learn, they comprehend the advantages of social life and readily accept the advice of the Chamorro Indian who rules over them. They have cleared a large part of the island, and have it well under cultivation. On the whole Garapan, under its Indian ruler, is better laid out, cleaner, and more orderly than many towns of greater pretensions in the Philippine islands,—and next to Agaña, is the most important and best looking place of the whole of the Marianas.

The Carolinian population do not give much attention to dress,—many go naked or nearly so, but in this respect they will probably improve, as the governor of the Marianas has established a school for boys, and another for girls at Garapan, where they are taught to read and write the language of CERVANTES.

The Commander of the *Narvaez* describes his interview with ARUMIAT,—the most celebrated of the Carolinian pilots, and a man of reputation among his neighbours. Although of low stature—which is uncommon among the Caroline islanders—he was still very strong and muscular. He wore no ornament excepting the stones

in his ears. His long hair, most carefully cleaned, fell luxuriantly over his shoulders; and notwithstanding that he was nearly naked, his movements were graceful and remarkable for decorum, and he conducted himself with that air of gravity and dignity which results from self-confidence and the habit of command. He knew the stars, and could describe the constellations. He knew that the pole star was stationary, while the other stars were continually moving round the earth,—that the belt of Orion rose and set throughout the year in the same parts of the horizon;—and that the planets were wandering stars differing from those in the constellations, which are relatively fixed; by the rising and setting of Orion he determined the east and west points, and the north by the pole star,—in fact he had an acquaintance with astronomy that was extraordinary for a man but little removed from a savage. He knew the position of all the Caroline islands and most of the Marianas, and could place them on the table by beans,—representing them in their true relative position excepting as to distance. He was acquainted with the mariner's compass in use in Europe, but regarded it as valueless for the Carolinians, who "carried it in their head." The Commander concludes by observing that on his return he would know more of this singular people,—“who go about naked, study cosmogony, and navigate the ocean in craft in which I humbly confess I should trust myself with considerable apprehension for my safety.”

The people of Garapan have a building-yard, in which their vessels can also be repaired and careened; a school for pilots; and their rope and cables are manufactured from the fibres of a tree—probably the cocoa-nut. They use no anchors; when a vessel brings up, one of the crew jumps overboard with the end of the cable in his hand and secures it to a boulder at the bottom; to unmoor, he jumps overboard and tracks the cable to the bottom, and loosens it from the boulder or head of coral round which it is secured;—the depth is nothing, the sharks are nothing,—the Carolinians are capital sailors, at home on or in the water,—at once ingenious and daring.

With craft 30 feet long, 4 feet beam, and 7 feet depth of hold,—some vessels, however, are larger, others smaller,—furnished with an outrigger, and carrying ten or more persons, they will navigate the Pacific, shaping their course by the sun or the stars, by the direction of the wind or that of the waves; they lay-to in a storm, and when it has passed over, make their celestial observations for position, and then continue their route.

The WEST COAST of Saipan is fringed by a chain of coral reefs extending from 1 mile to  $1\frac{1}{2}$  miles from the shore; towards the N.W. end of the island it is wider, and thence has an arm projecting to the S.W., near the extremity of which is *Mañagasa* islet, in lat.  $15^{\circ} 15\frac{1}{2}'$  N., about  $2\frac{1}{2}$  miles from a prominent point near the N.W. end of Saipan; the reef terminates at less than a mile southward of the islet.\*

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\* Prior to the visit of the *Narvaes* to Saipan, the charts were greatly in error, both as to the position of the island and the character of the reef near it. They showed an extensive reef stretching from the north part of the island and reaching to the N.W. point of Tinian,—in some places near the S.W. end of Saipan as much as 8 to 9 miles from the shore; on this were many scattered islets and banks. Nothing exists of this extended prolongation of the reef towards the S.W. extremity of Saipan, and to the N.W. end of Tinian. In fact the principal part of the reef extends off the N.W. end of Saipan, and there is none near the S.W. end but what fringes the shore. This error has been perpetuated in all charts since the publication of the original Spanish charts by D. JOSE DE ESPINOSA.

**Garapan.**—The anchorage off Garapan is very bad. The *Narvaez* was brought up just off the edge of the reef, where bottom was found,—which cannot always be done, as the reef is steep. The square of the town is in lat.  $15^{\circ} 12' 11''$  N., long.  $1^{\circ} 3' 24''$  E. of Umata,—by good observations on shore.

Garapan may be recognised from seaward by a tolerably large *white* rock on the shore, that may be seen from a considerable distance, being rendered conspicuous by the dark green colour of the trees and shrubs with which the island is covered, and looks like a white sheet in the midst of the country. When this rock bears between north and east it may be steered for; but when to the southward of east, or between east and south, there is danger in approaching the coast. The islet of Mañagasa must be left to port, allowance being made also for the reef which lies off it, and a vessel may anchor in 11 to 14 fathoms, taking care that the flagstaff of the town bears northward of east,—because on the east and west bearing of the flagstaff there is a *bank* called the **Tortuga**, that is very dangerous,—being nearly awash, by no means large, and on which the sea very seldom breaks. From the Tortuga to the northward there is a series of rocks, separated by narrow channels, and connected with the reefs off Mañagasa islet,—of which, in fact, they are a continuation.

The *anchorage* commences in 18 fathoms water about a good mile from the reefs, and decreases to 7 or 8 fathoms near them,—the principal houses of the town bearing about E.N.E., and the island of Mañagasa north, or N. by E. Everywhere the anchorage is rocky, with patches of sand.

The *Narvaez* anchored in 14 fathoms, rocky and sand, with the following marks and bearings,—MAÑAGASA islet,—W. point, N.  $11^{\circ}$  E.; E. point, N.  $14^{\circ}$  E.—SAIPAN island,—N.W. point, N.  $35^{\circ}$  E.; principal house of Garapan, N.  $68^{\circ}$  E.: S.W. point, S.  $1\frac{1}{2}^{\circ}$  W.—TINIAN island, N.E. point, S.  $14^{\circ}$  W.; N.W. point, S.  $24^{\circ}$  W.—Bearings magnetic,—Variation  $3^{\circ}$  E.

During the season of the N.E. Trades a vessel may lie at the anchorage of Garapan; but during the months of the S.W. Monsoon, a vessel caught in bad weather there will be in considerable danger.

A boat channel through the reefs affords approach to the town from the anchorage; it is tolerably wide and deep, and has been buoyed by the Carolinians. These buoys, which are really the trunks of trees, are a sufficient guide by day; but at night a pilot should be employed, for the channel is tortuous,—the reef being awash, with the sea breaking on it, so that a boat might be dashed to pieces if grounded.

**Tanapag.**—Between the N.W. coast of Saipan and the islet of Mañagasa the reef forms a spacious harbour, called by the natives Tanapag. The entrance is difficult, especially for a sailing ship, with a N.E. wind; it is a very narrow channel having several scattered rocky heads in it, which are covered more or less by the sea; but when through the channel the harbour affords snug and safe anchorage. The commander of the *Narvaez* had not time to make a plan of it; but it appeared to be protected from S.W. winds; it is as large as the harbour of San Luis de Apra, in Guajan, and like it protected from the breaking sea by a reef awash; nor has it the inconvenient shoals and reefs so numerous around the anchorage of Apra; in fact, so far as could be seen Tanapag is free from such dangers,—and there is plenty of water and a sandy bottom. The alcalde of Saipan says a whaler of great draught of water has entered and refitted there.

San Luis de Apra (in Guajan) and Tanapag (in Saipan) are the only harbours, properly so-called, in the whole of the Mariana archipelago. The other anchorages are but bad roadsteads in which vessels get little or no shelter.

**Magicienne bay**, near the S.E. end of Saipan, is nothing more than one of the points of the coast where regular soundings are found, and where a ship may bring up when the wind permits. The bay may be sufficiently safe with S.W. winds, but with those from the N.E. quarter it would be extremely hazardous to anchor owing to the heavy sea thrown into it. Also, if obliged to bring up at Saipan in August and September (the season of the strength of the S.W. Monsoon and of hurricanes), the harbour of Tanapag is preferable to Magicienne bay.

H.M. steam frigate *Magicienne*, Capt. N. VANSITTART, C.B., on her passage from the Hawaiian islands to Hong-Kong, in July, 1858, "having lost the N.E. Trades in long.  $156^{\circ} 38'$  E., and being short of fuel, steered for Saipan island, one of the Mariana or Ladrone group, and anchored in the bay on its south-east side, in lat.  $15^{\circ} 8\frac{1}{2}'$  N., long.  $145^{\circ} 44'$  E.

"This bay cannot be recommended to a sailing vessel, as the water in it is deep, and the anchorage so close to a coral reef bordering its shore, that with a southerly wind there would be no room to weigh. The depth is 30 fathoms, over coral with sandy patches, at only a third of a mile from the bluff at the head of the bay, decreasing rapidly to 3 fathoms close alongside the coral reef, which nearly dries at low water. The *Magicienne* anchored in 18 fathoms water, with the south-west point of the bay bearing S.  $\frac{1}{2}$  E. about  $2\frac{1}{2}$  miles; the south-east point, which is a bluff, E.S.E.  $1\frac{1}{2}$  miles; and a wooded bluff at the head of the bay, N.N.W.  $\frac{1}{2}$  W. nearly a third of a mile. When the vessel swung to the shore, there were 9 fathoms, coral patches, under her stern, and she was distant only a cable's length from the reef; at a cable's length to the southward of her anchor there was no bottom at 70 fathoms. The bay is well protected, being open only from E.S.E. to south.

"**SUPPLIES.**—There is a plentiful supply of wood growing on the shores of Magicienne bay, sufficient for any number of vessels, being for the most part the thickness of a man's body, white when cut, and in substance something between a bad ash and a poplar. The best place for landing is on the sandy beach to the eastward of the wooded bluff at the head of the bay. The crew of the *Magicienne* cut down and brought on board 172 fathoms in six days, the wood growing close to the beach, and easily carried to the boats, which could lie afloat close to the coral reef. The wood soon dried, but being freshly cut, it was necessary to split and bark it on board before using it for steaming purposes, also to use a small quantity of coal with it: the bark was very sappy. The wood being free of resinous substances, it did not give out so much heat as might have been expected; three and a half fathoms of it being only equal to one ton of good Welsh coal. No water could be obtained; wells were dug, but the water from them was brackish; indeed there appears to be no water on the island except what is caught during the rains, and the rainy season in August, September, and October. Cocoa-nuts, bread-fruit, and limes are plentiful; there are also many wild pigs and bullocks—the latter belong to the Spanish government. Pigs, poultry, and fruit can be obtained at the village.

"**WINDS.**—The few days the *Magicienne* remained in this bay, the wind was light

from the S.E. during the day, and at night a light air from the land between N.E. and N.W.

"TIDES.—It is high water, full and change, in Magicienne bay, at 6h. 45m., and the tide rises about  $2\frac{1}{2}$  feet."

**FARALLON DE MEDINILLA**, 44 miles N.N.E. from Saipan, is a flatish rock less than 2 miles long (N.E. by N. and S.W. by S.), and about  $\frac{3}{4}$  of a mile wide where broadest. Its elevation above the sea level is not great; its sides are perpendicular; and it everywhere abounds in large deep caverns.

The Farallon de Medinilla is undoubtedly of volcanic origin, and on its highest part there are vestiges of a crater; it is wholly destitute of vegetation, owing probably to the sea and spray washing it greatly during storms, although it is more than 50 feet high.

DUPERRY's plan shows a hummock near the S.W. extreme, united to the main rock by a low narrow neck of land; the *Narvaez* passed along both sides, east and west—carefully looking for this hummock, but it could not be seen;—the connexion was entire in every part, and all of the same height.

*Position*.—The centre of the islet is in lat.  $15^{\circ} 59\frac{1}{2}'$  N., long.  $146^{\circ} 0\frac{1}{2}'$  E.

**ANATAJAN island**, 27 miles N.W. from the Farallon de Medinilla, is 5 miles long (east and west), and rather more than  $1\frac{1}{2}$  miles wide; it is very high, and was seen from the *Narvaez* at the distance of 40 miles although the atmosphere was by no means clear.

The coast is everywhere steep and precipitous, except on the south side where there is a small strip of sandy beach, and some projecting rocks form a small creek; owing, however, to the great depth of water until close to the shore there is no safe anchorage. Three mountains are visible from this spot,—one of which is said to be an active volcano.

While the *Narvaez* was in the vicinity of Anatajan, on the 4th and 12th of January, 1865, the weather was rainy and generally bad; the commander therefore thinks it possible anchorage might be found on some other part, as the island was inhabited at the time of its discovery by the Spaniards.

Anatajan is well clothed with verdure,—with trees and bushes,—among which the cocoa-nut is very conspicuous.

*Position*.—The centre of the island is in lat.  $16^{\circ} 20'$  N., long.  $145^{\circ} 40'$  E.

**SARIGUAN island**, 20 miles N. by E.  $\frac{1}{2}$  E. from Anatajan, is a round rock about 2 miles in diameter, tolerably high, and covered with trees. It is said that there is a landing place on it, but the *Narvaez* did not stay to determine whether there is anchorage. It may be passed tolerably close, as the coast is clean and safe.

There is nothing remarkable about the island; it is evidently of volcanic origin, as its conical form indicates; the summit is rounded, and its crater (if any exists) must have been long inactive, for it is well covered with vegetation, notwithstanding reports to the contrary.

Sariguan, though now deserted, was formerly inhabited.

*Position*.—The centre of the island is in lat.  $16^{\circ} 40'$  N., long.  $145^{\circ} 47'$  E.

**The rectification of an error on the charts.**—It now becomes necessary to refer to an error which had existed on the charts for nearly half a century, and which has only been rectified within the last four years; the error relates to the number of islands between Agrigan and Sariguan, and a change in the name of some of the islands, dating from the French survey of 1819, when a shoal between Guguan and Sariguan was inserted on the chart as an island.

According to the French Survey of FREYCINET, in the *Uranie* (1819), the islands were as follows, in regular order from N. to S. :—

AGRIGAN Is.  
PAGAN Is.  
ALAMAGAN Is.  
GUGUAN Is.  
FARALLON DE TORRES Is.  
SARIGUAN Is.

According to D. EUGENIO SANCHEZ Y ZAYAS, Commander of the *Narvaez* (1864), they are as follows :—

= AGRIGAN Is.  
= Does not exist.  
= PAGAN Is.  
= ALAMAGAN Is.  
= GUGUAN Is.  
= PIEDRAS DE TORRES or Zealandia shoal.  
= SARIGUAN Is.

The discovery and source of the error and its rectification is related by the commander of the *Narvaez* in nearly the following words :—

On the 4th of January, at daylight, I left Garapan for the northern islands of the Marianas. At noon I was in sight of the Farallon de Medinilla and of the island of Anatajan; by the evening Sariguan was seen; and at sunset the three islands were distinctly visible, and the position of the vessel determined by them. I had with me Colonel FELIPE DE LA CORTE, of the engineers, the governor of the Marianas, who had visited the archipelago three times, but had not gone beyond Agrigan,—as much from the small size of the boat, as from the class of persons who navigated her. I had besides a good sailor as pilot for the islands, and the pilot of the harbour-master of Apra, who also had been several times over the archipelago south of Agrigan, and who knew the anchorages of the islands.

I had on board DUPEREY's charts of 1819,—the expedition of the *Uranie* round the world; plans of many of the islands; the British Admiralty chart, which is nothing more than a copy of DUPEREY's; the Spanish chart of COELLO, also a copy of the French chart, with the additional topography of some of the islands; and the "Pacific Directions" by FINDLAY; that is to say, all I could get on my departure from Manila, and they were ample. I had also three good chronometers, carefully rated up to my departure at the end of December from Umata, and a collection of instruments for navigation; and practice gave me confidence in my work. But I had not with me the chart of the Marianas published by the Spanish Hydrographic office in 1862, for it had not reached Manila at the time of my departure in November, 1863. This I have seen since my return, and find it to be a copy of FREYCINET's, and to his labours alone we are so far indebted for a chart of the Marianas, if we except those of Malaspina, at Guajan, in the *Descubierta* and *Atrevida*, towards the close of the last century.

I started under steam, in order to reach the Farallon de Pajaros at the northern extreme of the islands as soon as possible, intending to return from there to Guajan

under sail, availing myself of the N.E. winds ; with which also I reckoned on returning to Manila.

The weather was very fine, the wind light, the sea smooth, the sky clear, and the ship running to the northward at the rate of  $6\frac{1}{2}$  knots per hour. It is very well known that a steamer can easily reckon on the time when she will arrive at a given place ; I had made my reckoning, and retired at midnight, having allowed for an error perhaps of two miles, as there were no important currents to set me from where I ought to be at daylight.

I mention all these minutiae in order to show the way in which I found out the errors in the chart of the Marianas islands, and they were by no means inconsiderable before this examination of the locality.

At 6h. A.M. I went on the bridge, where the governor had gone just before me. The weather was remarkably fine, the sky without a cloud, and the sea like a looking-glass. Two islands were seen on the port hand.

I pointed them out to the governor as the Farallon de Torres and Guguan island ; but I observed with some surprise that SEÑOR DE LA CORTE was not of that opinion. He considered that the one which I called the Farallon de Torres was Guguan, and what I called Guguan was Alamagan ; and his opinion was based on the fact that he had seen them before, and they were known to him as he had designated them.

I took their bearings and laid down my position on the chart ; I was right—they were the Farallon de Torres and Guguan.

At 8h. I took time for longitude, which also corroborated my opinion ; besides, as the time drew on, we were sighting the heights of Alamagan ahead. I showed them to the governor, but he considered them to be the mountains, not of Alamagan, but of Pagan. SEÑOR DE LA CORTE had landed on these three islands, and knew them by the names of Guguan, Alamagan, and Pagan, while, according to the chart, I named them respectively,—the first, Farallon de Torres ; the second, Guguan ; and the third, Alamagan.

I called the pilot, who was on the fore-castle, entirely unaware of our controversy, and asked him the names of the three islands. The Indian sailor confirmed the opinion of the governor. The three islands according to him were, commencing from the south, Guguan, Alamagan, and Pagan.

Thus I was in the minority. But at the same time I felt certain I was right.

I returned to the chart, and the position of the ship according to the bearings of the three islands confirmed my view, as did the bearings of the two islands taken in the morning, and the longitude by chronometers.

I opened FINDLAY'S Directory ; and the descriptions of the Farallon de Torres and of the islands of Guguan and Alamagan there given, agreed well with the aspect of the three islands before our eyes.

So I had no doubt that both the governor and pilot were wrong.

However, notwithstanding all these proofs, the opinion of the governor though vacillating was not entirely changed, while at the same time he had perfect confidence in my navigation. We went on nearing one of the islands, and as each new feature became prominent the governor recognised as Pagan that which I had told him was Alamagan. As to the pilot, I told him he was mistaken, and like a good Indian he agreed with me. But his believing it was another matter.

At noon I observed the latitude, and noted it, the ship being a short distance off the N.E. point of that island, on which was a volcano in action, throwing out thick volumes of smoke. The latitude confirmed my previous conclusions, for the ship's position, by observation, verified the bearings.

There was no doubt then that the island ahead of us was Alamagan: the reckoning, the bearings, and the description in the Directory confirmed it;—on the N.E. end there were the conical mountain and active volcano: this mountain, separated by a valley from other mountains in the S.W. part of the island; and to the south of the island a high rock close to the shore:—volcano, valley, mountains, and rock.

After consulting the chart I went on the bridge, where SEÑOR DE LA CORTE was looking at the island, from which we were about a mile distant; I bantered him about his bad memory, and told him that as soon as we had passed the N.E. point of the island we should see Pagan. This island, by the chart, should be about nine miles N.N.W. of Alamagan, and would be known by having a detached rock about a mile to the southward of it.

We doubled the point with the volcano on it at about 1 P.M.,—with beautiful weather, not a cloud to be seen anywhere. But it was I that was wrong; Pagan was nowhere to be seen. And yet it ought to be there before us according to the chart, with its rock detached like a sentry, and with its three mountains more or less elevated. The Pagan of the chart could not be a myth. It was a veritable island, 4 or 5 miles long and 2 or 3 broad, and it could not sink in the sea, like a stone thrown into it by a child on the shore. Nevertheless no Pagan was to be seen.

But in the distance (about 40 miles) we could see through the mist on the horizon an island, that could be none other than Agrigan. Pagan therefore did not exist: before such evidence there was no other conclusion; and Pagan, as represented on the chart, had sunk in the sea.

The ship's head was laid for Agrigan on a course which would nearly pass over Pagan. At 7h. P.M. I stopped the engines off the S.W. coast of Agrigan, and I sent a boat on shore to fetch some people off it. This island, where we stayed four hours, was undoubtedly Agrigan, and the evidence was confirmed by those brought off: so at 1h. A.M. the engines were again set going, and our course continued.

On the following morning (the 6th of January) I passed the island of Asuncion, nearly touching its eastern shore, and by the evening saw the Urracas islands. I delayed about them during the night, so as not to lose them, and at daylight on the 7th I continued my course to the northward, sighting the Farallon de Pájaros; being thus at the end of my ground, I passed round it in the evening, after which I stood, under sail, to the southward.

At the 8th I was again off the Urracas islands, and in the evening off Asuncion. I reached Agrigan the next morning, where I anchored—without losing sight of the peak of Asuncion until the anchorage was made, and where it was concealed by the land of Agrigan. From this anchorage the volcano and mountains of the other island to the south, the name of which was doubtful, were seen.

On the morning of the 10th I left Agrigan, and anchored in the evening at the island called Alamagan in the chart and Directory, but which the natives of the Marianas called Pagan. I dropped anchor at dusk off its north shore, and remained there for the night. Here I found and brought thence five men.

At 8h. A.M. of the 11th I left my anchorage off Pagan, and rounded the island to the westward. On reaching its western point the other island, called in the charts and directions Guguan, and by the natives Alamagan, was seen. I continued my course to the southward with little wind but with clear weather. In the course of the day a third island was visible; and at dusk the islands we had in sight were, Pagan (Alamagan of the charts), Alamagan (Guguan of the charts), and Guguan (Farallon de Torres of the charts),—of all of which bearings were taken.

It should be mentioned, that not only the governor of the Marianas and the best pilot of the archipelago were on board the *Narvaez*, but also fifteen men, all of them sailors, whom I had found at Agrigan and Pagan. They all agreed in giving the name of Pagan to the island which the chart called Alamagan, and on the north shore of which I had anchored on the evening of the 10th; also Alamagan to the island which the chart called Guguan; and again, Guguan to that which the chart called Farallon de Torres.

The astronomical observations proved to me that the positions of the three islands, on the chart, were good: the mistake was in the names.

At daylight on the following day the islands in sight were, Alamagan (Guguan of the chart), Guguan (Farallon de Torres of the chart), and lastly, Sariguan.

It was evident then from this, and what I had seen in my voyage to the North, that between the island of Sariguan and the island of Agrigan there are not more than three islands, although the chart showed four: that the island which had no existence is that which in the chart bore the name of Pagan: that the other three were misnamed on the chart, to each of which has been assigned the name of that to the south of it: that the astronomical positions of the three which do exist were well laid down on the chart; in fine, the chart gave one island too much, and misnamed the others.

Until the voyage of the *Narvaez* (1864) these errors were found on all modern charts of the Marianas,—all being copies of those made by the officers of the French expedition of 1819 round the world in the *Uranie* and *La Physicienne*, commanded by FREYCINET. This expedition remained five months in the isle of Guajan, for want of provisions, which they had to wait for from Manila, and while thus waiting the French employed themselves in correcting the chart of the islands.

They drew the plan of Guajan island, and of all its anchorages, making the tour of the island in a launch, and connecting the several points by triangulation. This work is undoubtedly well done. They also constructed the plan of Rota island, and of part of the island of Tinian (the roadstead of Sunharon), which they reached in their excursions. These are also very good, although inferior to the plans of Guajan. Their work of critical examination did not extend north of Tinian.

The expedition having been refitted, and having obtained supplies from Manila, the *Uranie* left the port of San Luis de Apra for the Sandwich islands. She crossed the archipelago of the Marianas in her way, and rectified the positions of the islands as she passed them,—under sail, and without losing time. The plans of the islands called by them Farallon de Medinilla, Farallon de Torres, and Guguan island are nothing more than sketches made from the deck or the mast-head,—and hence the source of the error.

The French, leaving the Marianas not to return, carried no pilot for the islands,

and it is not to be supposed that the officers knew much of the archipelago, allowing, what is not very likely, that any of them had been there before. So while passing the islands and making observations, they corrected the published chart, as is customary.

It is most likely that the Spanish chart (in six sheets) of the Indian Ocean, published in 1812, by DON JOSE DE ESPINOSA, was on board the *Uranie*,—in the second sheet of which is the archipelago of the Marianas; it was the best chart of these islands at that time. This sheet shows two dots (without name) between Sariguan and Guguan; they indicate rocks; but are erroneously placed S.W. of Guguan, when really they are south of that island.

Before the appearance of ESPINOSA's chart, two rocks forming a shoal were known to be situated thereabouts. They were called the Piedras de Torres, because a governor of this name gave a memorandum of their position to all the captains who arrived at Apra or Umata. When TORRES left the governorship of the Marianas, the note passed into the hands of his successors, and I believe still lies in the archives of Agaña. It may therefore be supposed that while the *Uranie* was in the port of Apra, SEÑOR MEDINILLA, then governor of the archipelago, informed the French of the existence of the Piedras de Torres.

When the *Uranie* left Apra, she ran to the northward in search of the Piedras de Torres, at the same time rectifying the position of the islands of the archipelago. The small islet to the north of Saipan, which in the Spanish chart appeared as a dry Farallon (islet), but without a name, was called by them the Farallon de Medinilla, in memory of the hospitable governor to whom they were indebted for so many favours.

As already said, to the north of Sariguan should be the Piedras de Torres. But they did not see it, and passed on; which is not surprising, because it is awash,—a fact of which perhaps they were not aware. Assured of its existence, but having no pilot on board to give any information on the subject, they connected the accounts received at Agaña respecting the nameless rocks shown on the Spanish chart with Guguan island, which is very small;—being near the place where the rock they were in search of was supposed to exist; at the same time the Spanish chart of ESPINOSA contributed to the mistake, from the mode in which the rocks were laid down, hence Guguan came to be named the Farallon de Torres.

This mistake having occurred, and Guguan being called Farallon de Torres, they naturally gave the name of Guguan to the first island to the northward, which was Alamagan. Then came another which they called Alamagan, but which in reality was Pagan island; and thus these islands came to be described under their new names. And ESPINOSA's chart could not rescue them from their error, for that part is badly shown, and the scale being small, the positions were not easy to determine.

To the north of the last island another was wanted, which was Pagan according to their account; but the weather became bad, and there was much mist. When the fog lifted they thought they saw another island, 9 miles north of their Alamagan, and they placed it accordingly in lat.  $18^{\circ} 15'$ ; making it 4 miles long, and marking a rock or small islet, which they thought they saw, on its southern side. FREYCIER, in his account of the voyage of the *Uranie* and *Physicienne*, says that he saw Pagan through the mist. The island being placed on the chart, they soon after

passed near Agrigan, which is described under its true name, and shortly afterwards leaving the archipelago, there was no opportunity for rectifying the error they had made.

The mistake of the French in taking a fog-bank for the island they were looking for, is nothing strange. Every navigator knows how common such appearances are at sea, and how easy a mistake of this kind can be made, even by eyes which are accustomed to see land and clouds on the horizon.

From 1819, the year of the *Uranie's* voyage, no other vessel had visited the Marianas, for the purpose of examining them, until the year 1864, when the *Narvaez* went on that errand. It is no cause for surprise, therefore, that the mistake of the French chart should have remained so long undiscovered, for in order to rectify it nothing less than an examination of all the islands would suffice, and an expedition like that of the *Narvaez* was necessary.

**PIEDRAS DE TORRES** (called also **Zealandia** rocks).—The channel between Sariguan and Guguan (the next island to the north) is 35 miles wide, but it must be navigated with caution, inasmuch as the dangerous shoal known as the Piedras de Torres or Zealandia rocks lies about 11 miles northward of Sariguan.

The Piedras de Torres are the same as shown on ESPINOSA's chart, between Sariguan and Guguan, with an error in position. But as already observed, not having been seen by the *Uranie* in 1819, or rather, FREYCINET mistaking Guguan island for them, they disappeared from the charts, and it was concluded that the channel north of Sariguan island was free from danger.

The existence of the shoal is undoubted, and has been known to the inhabitants of the Marianas for the last fifty years or more. It was reproduced on the charts in 1859 under the circumstances related in the *Mercantile Marine Magazine*, vol. vi. (for 1859), pp. 283-4; Capt. J. FOSTER of the *Zealandia*, bound from New Zealand to China, December, 1858, shaped a course to pass between Sariguan and Farallon de Torres (as Guguan was then called); he saw two dangerous shoals, which the unsettled state of the weather and the lateness of the day did not permit him to examine very closely;—the following are the particulars respecting it. "At 4 P.M. Sariguan island bearing S.S.W., distant 12 miles; wind light from the eastward; ship steering W.N.W. about 4 knots; breakers were reported right ahead; saw two large patches about  $\frac{1}{2}$  of a mile from the ship; altered course to pass about  $\frac{1}{2}$  a mile northward of them, keeping a good look-out from the topsail-yard. At 4h. 20m. P.M. Sariguan island bore S. by W.  $\frac{1}{2}$  W., distant about 11 or 12 miles, and the breakers in one with the island, distant from the ship about  $\frac{1}{2}$  a mile. The two patches bore from each other N. by E. and S. by W., about a  $\frac{1}{2}$  of a mile apart,—with dark water between and all around them;—the sea broke at times heavily.

The *Narvaez* found fifteen wrecked persons on Agrigan and Pagan. They formed the crew of a launch (the only pilot craft in the Marianas) which left Agaña for Agrigan, in July, 1863, to found and commence a small establishment for curing fish. After leaving ten men at Agrigan, the vessel was lost on Pagan in a gale on the 11th of August. She was all but lost on the Piedras de Torres on her way from Agaña to Agrigan; heedless, like all Indians, they did not see their danger until nearly on them. All the fifteen persons saw the reef; one of them, named

**SALAS**, an intelligent and superior seaman, gave me the following description of it:—"There are three rocks awash; each being about as large as a boat; and they are a cable's length in extent, more or less. In their vicinity the sea has no appearance of bottom; and in fine weather there is no break, except at very long intervals." This man, **SALAS**, as well as the pilot, whom I had with me, told me that they have frequently passed near these rocks; and have seen two at low water spring tides.

The *Narvaez* was in their vicinity on the 12th of January under easy sail with little wind, but was as unfortunate as the *Uranie*, for they did not show. In the morning she was 14 or 16 miles to windward of them, and the wind failing, the fires were ordered to be lighted at noon; but some repairs were going forward in the machinery, and the engines could not be worked until five in the evening. When looking for the rocks night came on, and with it the wind, which all day had been light, freshened up.

The commander adds,—"The position of this danger from the account of the *Zealandia* differs very little from the truth. The direction in which the Indians told me to search on leaving Sariguan was nearly the same as that where it is laid down on the chart. However, while we cannot correct the position, it should be passed with the utmost care; for in fine weather it is a shoal of the most dangerous description, as it cannot be seen,—there might be no sign of it until the ship was upon it." *Approximate position*,—lat.  $16^{\circ} 51' N.$ , long.  $145^{\circ} 50' E.$

**GUGUAN** island, heretofore called the **FARALLON DE TORRES**, lies 35 miles to the northward of Sariguan. It is small, being about  $2\frac{1}{2}$  miles long (N.N.E. and S.S.W.), and 1 mile wide; of moderate height, with two slight eminences,—one near the centre, the other more to the southward. In every direction the coast is precipitous



*Guguan Island, bearing S.  $72^{\circ} W.$  (Narvaez.)*

and bold, with no outlying reefs, and the sea breaks against its very cliffs. It greatly resembles the Farallon de Medinilla, and like it is destitute of anchorage and landing-place. The wall-like shores are high, but lowest on the N.E. side, and even here do not present the slightest facility for approach in a boat. The whole is covered with vegetation.

The geographical position of Guguan precisely agrees with that of the Farallon de Torres of **DUPERRÉY**'s chart,—as also does its appearance with the description of the latter as given in sailing directions.

*Position*:—The northernmost prominent hill is in lat.  $17^{\circ} 16' 50'' N.$ , long.  $145^{\circ} 50' 20'' E.$  **DUPERRÉY** made it  $7'$  more easterly.

**ALAMAGAN** island, hitherto called **GUGUAN**, lies  $16\frac{1}{2}$  miles due North (*true*) from Guguan. It is a high, massive volcanic mountain, its horizontal contour being an irregular pentagon, about  $2\frac{1}{2}$  miles long (North and South), and rather more than 1 mile wide (East and West). It has two peaks,—the northernmost of which emits smoke.

Alamagan, seen from the eastward, looks like a great mountain of lava. To the S.E. it is nearly vertical, and completely destitute of vegetation; to the N.E. the rock, where less abrupt, is covered with moss, but the sides are bare and of a red-



*Alamagan Island, bearing N. 38° W., distant 5 or 6 miles. (Narvaas.)*

dish hue. On the N.E. side there is a very large extinct crater,  $\frac{1}{2}$  a mile across—not on the summit of the mountain, as is generally the case in volcanoes—but on its slope, so that the circular crater, seen from seaward, shows as a large elliptical opening below the North peak; when the island is seen bearing between South and West, the interior of this immense extinct crater is fully exposed to view.

Seen from the westward the mountain presents two peaks, from one of which smoke was issuing in great volumes in January, 1864. The South and S.W. slopes are very steep, that to the N.W. less so. The western side of the mountain is traversed from summit to base by deep ravines, in which vegetation of a dark hue is abundant, but especially thick in the lower parts, so that from a distance the island appears clothed in green,—not uniformly, but in stripes, which taper away towards the top of the mountain.

The coast is everywhere precipitous. There is no bank nor reef near it; nor does there appear to be any landing-place, unless perhaps on the N.W. side,—the only place where the attempt ought to be made.

Two sets of good observations on different days and at different distances made the altitude of the island 2300 feet.

The appearance of Alamagan agrees in every particular with that hitherto given for Guguan, and its geographical position with that of Guguan on DUPERRÉY'S chart.

*Position* :—The easternmost point is in lat.  $17^{\circ} 35' N.$ , long.  $145^{\circ} 51' 55'' E.$

**PAGAN** is the island hitherto called **ALAMAGAN** on the charts, and described as such in sailing directions. It is 25 miles northward of Alamagan, and the channel between the two islands has no known dangers in it. It is about 8 miles long (N.E. and S.W.), and  $2\frac{1}{2}$  miles wide,—from a distance showing as two or three islands, for its two extremes are high, with a deep valley between them.

Pagan has three active volcanoes on it; one near its N.E., and the others near its S.W. end. The first is a conical mountain, which, when seen in January, 1864, was throwing out dense columns of smoke. The two which are to the S.W. are open craters in the huge mountain which terminates the island in that direction; one of these craters is very large; the other was emitting flames. The valley in the middle of the island is formed of dark sand, on which flourishes an immense quantity of various kinds of shrubs. The tropical vegetation reaches almost to the summit of the mountains in spite of the volcanoes,—excepting on the N.E. cone, which is nearly destitute of any.

There is very little water on the island; but pigs and fowls are to be found in abundance.

It was on this island that the pilot boat was wrecked, as mentioned on p. 96. Her crew stated that on the mountain slopes and on some parts of the level ground the heat of the soil is so great that there is no standing on it with the naked feet.

The *Narvaez* anchored off the N.W. coast, which, towards the middle of the island, forms a kind of cove. The anchorage may be known by a great rock on the beach, and which, at 6 or 7 miles off, looks like an islet. At 3 or 4 cables north of the rock, are 14 fathoms, rock and coral,—soundings which continue to half a cable from it; consequently anchorage is bad. The beach is of black sand, with a good many large rocks among it; and the surf breaks on it with great fury;—hence landing is very difficult, besides which, when the boat's bow touches the beach, her stern will be in 2 fathoms' water; the waves are high even in fine weather, and there is much danger of the boat being capsized.

About a mile N.E. of this rock, there is a low, sandy beach, where probably the anchorage is better and the landing easier. The colour of the sea indicates shoaler water, with sandy bottom, and the surf is not so great there. The pilot of the *Narvaez*, however, knew nothing of it; and there was no time to survey it; but the commander believes it should be preferred to where he brought up, and adds,—“for bad as it might be, it could not be worse than that which I had selected. To find it, all that is necessary is to lay the ship's head for the rock above mentioned,—a capital mark for it,—and when at 2 or 3 cables from it to sheer to port along the shore and anchor. It is necessary, in taking any of the anchorages of the Marianas to keep the lead going in both chains, and the ship under small sail.

This low beach is formed by a narrow tongue of land, which separates the sea from a large and deep lagoon beyond it. The governor of the Marianas thought that by cutting through this it might be formed into a good port. But for my part, I think the lagoon is but the edge of an old crater which has been inundated by the sea. Even were it not so, a port would be of no use in a deserted island which, in an extent of 8 miles, has three active volcanoes.

The anchorage is wretched,—entirely rocky, with little or no shelter,—very near a wild rocky shore, which is nearly perpendicular, and full of dykes. During the night I remained there we had several squalls; the vessel dragged her anchor, and only brought up at 2 cables from her berth.

The southern shore of Pagan is still more exposed than the northern. On the south side, close to the S.E. point, there are three high pinnaced rocks, one of them having a hole through it. From a distance these appear as if they were islets detached from the shore, similar to that on the northern side; but they are not distant from it more than a cable or two,—or perhaps on the beach like that near which I anchored. Near these rocks on the south side of the island, it is possible that anchorage may be found.”

Pagan has a certain celebrity among the Marianas, on account of a treasure which was supposed to be concealed there; but the commander of the *Narvaez* thinks that if any such concealment ever took place Agrigan would have been selected in preference to Pagan.

*Position* :—The centre of the island is in lat. 18° 5' N., long. 145° 50' E.;—the

S.W. end in lat.  $18^{\circ} 21' N.$ , long.  $145^{\circ} 47' E.$ ;—the N.E. end in lat.  $18^{\circ} 7' N.$ , long.  $145^{\circ} 53' E.$

**The mythical Pagan.**—The island named Pagan, with an islet to the southward of it, in lat.  $18^{\circ} 15' N.$ ,  $145^{\circ} 52' E.$ , as laid down in DUPERREY's chart of 1819 (and copied into most other charts until recently), has no existence; it was a mistake, as described on p. 95.

**AGRIGAN island**, frequently misnamed ASSUMPTION, and called the GREAT VOLCANO by ESPINOSA, distant 41 miles N. by W.  $\frac{1}{2}$  W. from Pagan, is about 6 miles long (N.W. and S.E.) and  $2\frac{1}{2}$  miles wide. It is not 2026 feet high, as usually stated in sailing directions,—being in reality scarcely two-thirds of that height.

Seen from the South, at a considerable distance, the island presents the rude outline of a trapezium, with two small eminences at the upper angles,—hence its name of Agrigan, which in the Chamorro language signifies a "shell,"—though not a single shell is found on its shores.



*Agrigan Island; the centre bearing East, distant 3 to 4 miles. (Narvaez.)*

The *Narvaez* anchored first about  $\frac{1}{2}$  a mile from the West coast,—and afterwards off the S.W. coast. The vicinity of the island in every direction is quite clean and safe to approach. Running down the western shore, within a short distance of it, no break whatever could be seen except on the beach; it is steep-to, and the part where a vessel can anchor is very limited; everywhere else the water is very deep close to the rocks near the shore. This anchorage may be known by being off the only sandy beach on the whole island: there is no bottom to be had until within 4 cables of the shore, when regular soundings in 16 to 17 fathoms are found, bottom of black sand. The anchor must be dropped before a small reef—the only one found there—extending off the N.W. end of the beach. The pilot of the *Narvaez*, who had often been to Agrigan, stated that there was no other anchorage. The position taken up by the *Narvaez* was in 11 fathoms, black sand, with the following magnetic bearings:—

Agrigan island . . .	{	S.W. point . . .	N. 24° W.	} <i>Var. 3° E.</i> in 1864.
		S. point . . .	S. 64° E.	
Pagan island . . .	{	N.E. volcano . . .	S. 16° E.	
		Central summit . . .	S. 12° E.	
		S.W. summit . . .	S. 11° E.	

At anchor, the vessel lay 3 or 4 cables' distance off shore, and rather more than a mile from the landing-place: the holding ground is good, but the position is exposed; no vessel could anchor there with the wind from West to S.W.

Between this anchorage and the South end of Agrigan there is a patch of very clear

water as if shoaler than elsewhere, with dark parts here and there indicating a greater depth; soundings from the boat gave  $5\frac{1}{2}$  fathoms, so probably the discoloration arises from the character of the bottom; but still, a vessel should approach it very cautiously.

The landing-place is very bad; so steep is the beach that when the bow of the boat is aground, the stern is in deep water; the swell is also considerable, and well nigh knocks a boat to pieces. The commander of the *Narvaez* landed from a canoe, made out of the trunk of a tree about a foot wide, and called *baroto* in the Philippines; it only holds one person besides the Indian who paddles it; but in such a craft the man SALAS (p. 97) found his way from Pagan to Agrigan.

The beach is composed of coarse black sand, which however is extremely light. The island is evidently volcanic, though there is no vestige of an open crater; but the calcined scorice and pumice stone sufficiently indicate their origin. There is a small rock on the South point, and several larger rocks are scattered here and there along the shore of the island.

Sailing directions say "Agrigan is larger than Asuncion to the northward of it;" this is not so, and though volcanic the following description is also inaccurate:—"On its north and south sides are a few trees descending gradually from what appears to be a crater, which at some period has deposited streams of lava, or black ashes, a considerable distance down its side." No crater—old or recent—is to be seen, nor are there any streams of lava; the soil is very fertile, and the surface of the island is covered with vegetation from the shore to the highest summit.

Agrigan produces, in abundance, cocoa-nuts, plantains, and other tropical fruit and roots; pigs, goats, and fowl are also plentiful. A salting-house like that at Tinian had been established, but it failed on account of the distance. The *Narvaez* left on the island a large quantity of animals of various kinds; and any vessel touching there in future will find furnished huts and out-buildings with various conveniences in them, cultivated land, domestic animals, &c.; and as a watch over all, a humble wooden cross on the grave of a Christian beneath the shadow of a cocoa-nut tree.

*Position*.—N.W. point lat.  $18^{\circ} 51' N.$ , long.  $145^{\circ} 37\frac{1}{2}' E.$ ;—S.E. point lat.  $18^{\circ} 46\frac{1}{2}' N.$ , long.  $145^{\circ} 42' E.$

**ASUNCION** island lies 55 miles N. by W. from Agrigan. The *Narvaez* passed, first along its eastern side, within the distance of  $\frac{2}{3}$  of a mile, and then along its western side at the distance of  $1\frac{1}{2}$  miles.



*Asuncion Island, bearing E.S.E., distant 2 miles. (Narvaez.)*

It is a conical mountain about a mile in diameter, on the summit of which there is a wide crater. When passed by the *Narvaez* the first time, it was crowned with a

white vapour, which was not considered to be smoke of the volcano, but thin clouds resting on the mountain. The eastern slope is of lava, and it appears that the wash of the sea rises to a considerable height up its side. In fact the effects of the sea are visible to a height of about 270 feet, perhaps more,—an evident proof that in severe storms, the sea which is very deep in the vicinity of the island rises in waves of great height, which, breaking on the shore, dash up the sloping sides of the mountain.

On its eastern side there is scarcely any vegetation; only a little moss and lichen is seen above the limit reached by the sea.

When passed on the second occasion sea and air were nearly calm. On the shore no other break was seen than that against the actual side of the mountain, and there can be no doubt that alongside of it the depth is very great. Off the middle of the island there was a change in the colour of the water; hauling off and sounding, no bottom was found with 110 fathoms, when about  $\frac{1}{2}$  a mile from the shore.

Off the North extremity of the island there is a rock with a large hole in it which shows daylight through it, and through which the sea washes. North of it are two detached rocks above water, and between them and the point the sea breaks. These rocks are distant about a cable's length from the island.

On the western side the slope of the mountain is rather less steep, but very little. In fact, it may be almost considered a perfect cone. Off the South point, which is the lowest part of the island, there are two or three rocks, but not  $\frac{1}{2}$  a cable from it. On the S.W. side some trees are to be seen, and some undergrowth near the base of the volcano and near the sea, for the vigorous vegetation of the tropics flourishes alike on rocks, sand, or ashes.

The rocks off the South point are exactly in one with the point itself; and the same occurs with the rocks off the North point, extending to the northward of it.

LA PEROUSE's party is probably the only one that ever tried to land on Asuncion island; the following is his description of it:—

“As we had set the *Manga* from our anchoring-place, bearing  $28^{\circ}$  west (*sic*), distant about 5 leagues, we observed that the three rocks of this name are likewise placed  $30'$  too far to the northward, and it is almost certain that the same error exists as to the *Uracas*, the last of the *Ladroneas*, the archipelago of which only extends to  $20^{\circ} 20'$  north latitude. The Jesuits have estimated the relative distances of the *Ladrone* islands from each other with tolerable accuracy, but the astronomical observations respecting them are very indifferent. They have not judged with more felicity concerning the size of *Assomption*, for it is probable they had no other means of ascertaining it than those of estimation. They say that it is six leagues in circumference, but the angles we took reduce it to half this size, and the most elevated point is about two hundred toises above the level of the sea. The most lively imagination could not easily depict a more dreadful spot. The most ordinary view, after so long a passage, would have appeared enchanting to us; but a perfect cone, of which the surface, as far as forty toises above the level of the sea, was as black as charcoal, could not but mortify us, by destroying our hopes: for we had feasted our imaginations, for several weeks, with the turtle and cocoa-nuts we expected to find upon some of these islands.

“We perceived indeed a few cocoa-nut trees which occupied scarcely a fifteenth

part of the circumference of the island, in a hollow of about forty toises, where they were in some measure sheltered from the East winds. This is the only place where it is possible for vessels to anchor in thirty fathoms, upon a bottom of black sand, which extends about a quarter of a league. The *Astrolabe* had already gained this anchoring-place, and I had myself let go my anchor at the distance of a pistol-shot from that frigate, but having dragged it half a cable's length, we lost all bottom, and were obliged to weigh with a hundred fathoms of cable out, and to make two tacks in order to approach the land. This slight misfortune gave me no concern, because I saw that the island did not deserve a long stay. My boat went on shore, as did that of the *Astrolabe*. I had observed with my telescope that they found great difficulty in landing. The sea broke everywhere, but they at last profited by an interval of calmness, and got on shore, after having first plunged up to their necks in water. I was apprehensive that their getting on board might prove still more difficult, as the surf might increase every moment. This was the only event which could induce me to anchor, for we were all as urgent to depart as we had before been desirous of reaching this spot. Fortunately, at two in the evening I saw our boats return, and the *Astrolabe* set sail.

"Lieut. BOUTIN reported that the island was a thousand times more horrible than it appeared at the distance of a quarter of a league. The lava from the volcano has formed in its course ravines and precipices, bordered with a few stunted cocoa-trees remote from each other, intermixed with creeping underwood, and a small number of plants, among which it is almost impossible to advance a hundred toises in an hour. Fifteen or sixteen persons were employed from 9 in the morning till noon to carry to the two boats about a hundred cocoa-nuts, which they had only the trouble to collect under the trees; but the difficulty consisted in conveying them to the shore, though the distance was very short. The lava has covered the whole surface of the cone, except a narrow portion of about forty toises towards the sea. The summit appears in a certain degree vitrified, but the glass is black and of the colour of soot. We did not perceive the top of the cone, as it was constantly enveloped in a cloud; but though we did not see it smoke, the odour of sulphur, which it spread to the distance of half a league at sea, led me to suspect that it was not entirely extinguished, and that its last eruption was probably not very ancient, and there is beside no appearance of decomposition in the lava on the middle of the mountain.

"Every circumstance announced that no human creature nor quadruped had ever been so unfortunate as to have selected this island for an asylum, upon which we saw no other animal than crabs of the largest species, which would be very dangerous in the night to any one who might resign himself to sleep. They brought one of them on board. It is probable that this crustaceous animal has driven from the island those sea-birds, which always lay their eggs on shore, but which in this place could only deposit them to be devoured. We saw only three or four boobies at the anchoring-place; but when we approached the Mangs our ships were surrounded with a numberless flock of birds. . . . The hundred cocoa-nuts, and the few objects of natural history, which we had so rapidly snatched from this volcano, for such it truly is, had exposed our boats to the greatest danger. Lieut. BOUTIN, who was obliged to throw himself into the sea, both in getting on shore and in recovering the boat, had his hands cut in several places from being obliged to rest them on the

sharp rocks that surround this island. Mr. DE LANGLE had also encountered some dangers, but they are inseparable from the landing on all such small islands, and particularly of so round a figure. The sea, which comes from the windward, glides along the coast, and forms a surf upon all the points, which renders the landing extremely dangerous.

"Happily for us we had sufficient water to serve us to China, for it would have been difficult to have taken in any at Assumption, if indeed, there be any on the island. Our detachment saw none, except in the cavities of some of the rocks, where it remained as in a vessel, in no case exceeding the quantity of six bottles.

"At three in the evening, the *Astrolabe* having made sail, we continued our course west-north-west, passing the Mangs at the distance of three or four leagues, bearing north-west by north. I could have wished to have determined the position of the Uracas, the most northerly of the Ladrões; but this would have consumed a night, and I was in haste to reach China."\*

The description which LA PÉROUSE gives of Asuncion is in no way exaggerated. The island is arid and desolate in the extreme. As the illustrious navigator observes, it is a mere volcano.

When the *Narvaez* passed along its western side, the weather was superb. The summit of the mountain was entirely free from cloud or vapour of any kind, and it was seen to great advantage. The peak is covered with ashes all around, which occupy more than a third of the upper part of the volcano. Not the slightest trace of smoke was to be seen; but it is not an extinct volcano, for if it were the vegetation of the tropics would have commenced to grow on the lee side of the mountain; but there was none.

LA PÉROUSE undoubtedly anchored on the S.W. side of the island, perhaps near the south point; for on the windward side it would be impossible; but I cannot tell where, for although I sought for a place I could find none where there was any appearance of soundings. The sea was of the same colour all round it, and broke heavily on every side, echoing from the rocks on which it broke in that deep tone which betokens deep water.

Asuncion is very high. LA PÉROUSE does not give it more than 420 metres (1378 feet); but he did not see its summit, and consequently his calculation is only approximate. Other navigators (*see* RAFFER) make it 2026 feet; but that is evidently too little. It may be perceived by a glance that the cone is in height half the breadth of the base, and this being about one mile across, it is clear that the height of the peak must be nearly half a mile. This is by estimation of the eye, and it has been confirmed by calculation. Two series of very good observations were made on board the *Narvaez* at different distances from the volcano, under most favourable circumstances, without a cloud in the sky, the sea calm, and no vapour about the mountain. The results of these observations gave a mean of 2600 feet, three hours having intervened between the two sets of observations, and the change of position of the ship with respect to the island being 7·7 miles.

*Position*:—The centre of Asuncion is in lat. 19° 45' N., long. 145° 30' E.

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\* On a careful perusal of this extract, seeing what LA PÉROUSE says of the Mangs (*see* p. 103) and of the Uracas above, he calls what are now known as the Urracas, by the name of Mangs, —and Pajaros island, the Uracas.

The **URRACAS** islets lie N.N.W.  $\frac{1}{2}$  W. 22 miles from Asuncion, and there is no known danger in the channel between them. The *Narvaez* passed very near the Urracas,—first to the eastward and then to the westward. They consist of three islets, of which the westernmost is the largest, and that to the N.E. is the smallest. They are tolerably high, very jagged, and together form a circle about 2 or 3 miles in diameter, enclosing a species of lagoon. They are connected by breakers extending from one to the other, and which seem to complete the circle marked out by the lay of the islets. Seen from the outer side, the circle is uniform enough, but the inner sides of the Urracas appear to be very broken, and in detached masses. The aspect of the exterior is that of reddish lava, that of the interior is black and burnt-looking. The group has the appearance of having been one huge conical volcano, the summit of which has fallen in either from the action of fire or from some similar cause. Everything tends to corroborate this opinion, and on approaching the islets what at first seems probable becomes a certainty. At one time it was undoubtedly the twin brother of Asuncion.

The line of the outer shore of these islets preserves as near as possible the circumference of a circle: broken as it is in three parts, still the rocks under water



*The Urracas, bearing W.N.W. (Narvaez.)*



*The Urracas; (A) bearing N.E. (Narvaez.)*

continue it, as they connect one islet with the other. Outside the limit of the circle there are no rocks whatever: the sea broke in some places, but still it was on the rocks of the islets. The outside face of these rocks is an abrupt declivity, but smooth and regular. The inner surface is all confusion and disorder;—the irregular masses sloping towards the centre have deep clefts and fissures extending from top to bottom. The surface of the disrupted rocks is everywhere black and burnt; and the sea inside is studded with points of rocks scattered about in every direction. Such a condition is evidently that which would be left by a volcano, the crater of which had broken in.

It is altogether a miserable and desolate group,—without a tree, without a blade of green, or even a run of fresh water. The only sign of vegetation is a little moss near the summit of the western islet, barely covering the exterior face of the rocks.

On the two other islets there is not even this. Before subsiding, the volcano of the Urracas, like all the others in the Marianas, would have trees and some vegetation on its western slope, which is the lee side of the mountain. The very small quantity of vegetable mould which now remains without being burnt up, is accordingly found on the western side of the islet, and gives nourishment to the little moss found there.

The commander of the *Narvaez* thinks that (geologically) this disruption is not of very ancient date. It may be some few centuries; but as yet the birds (of which there are plenty) have not deposited much guano; nor has the tropical sun fostered with its powerful rays the growth of vegetation.

The Urracas, instead of being a maritime danger, are excellent sea-marks. They are visible from a considerable distance; and a vessel may pass them at almost any distance, as outside of the circle which they form there is no danger, whatever.

*Position*.—The centre of the Urracas is in lat.  $20^{\circ} 6\frac{1}{2}'$  N., long.  $145^{\circ} 20'$  E.

**The mythical Mangs or Monjas.**—The charts used to show a small group of islets, surrounded by an extensive reef, called by some the Mangs or Mangas, and by the Spaniards Monjas. DON JOSE ESPINOSA's chart shows nothing of them: that of DUPERRÉY places them S.S.W. of Asuncion; other charts placed them N.N.W. of Asuncion,—between that island and the Urracas: so that the group was wandering about as if it had no moorings in the ocean! The fact is, it has no existence, as the commander of the *Narvaez* has shown.

"The first person I believe who ever spoke of them was LA PÉROUSE, in the journal which he sent to France from Kamtschatka; the part of which referring to the Marianas is given on pp. 102–104. He says there, that being anchored off Assumption, he noted the Mangs,  $28^{\circ}$  W. This name is evidently a mistake. What LA PÉROUSE did mean was the Urracas, which are distinctly seen from Asuncion, and which I saw when I was passing the anchorage of the French Admiral. The bearing itself is also imperfect and confusing.

"Some sailing directions reading LA PÉROUSE's journal to mean N.  $28^{\circ}$  W. have given the Mangs on that bearing from Asuncion, distinct from the Urracas, for LA PÉROUSE distinctly says that he never saw the latter. In consequence of this, some charts have placed the Mangs N.N.W. of Asuncion, between this island and the Urracas,—first laying down Asuncion, then the Monjas, then the Urracas. The Spanish chart of 1862 had adopted this course. Others again place them S.S.W. of Asuncion, as does the French chart of DUPERRÉY.

"English charts placed them S.S.W. of Asuncion with the name of "Mangs;" but they placed the Urracas N.N.W. of Asuncion, calling them also Urracas or Mangs. So that the islets were really placed in two positions, one S.S.W. and the other N.N.W. of Asuncion.

"Laid down in the chart on the authority of LA PÉROUSE, no one that I know of excepting FRÉYCINET has said that he really saw the Mangs. The commander of the *Uranie*, in the account of his voyage, says that he saw these isles from the mast-head of his corvette in showery weather, and the chart of DUPERRÉY, drawn on board the *Uranie*, places them, as said above, S.S.W. of Asuncion.

"I have sought for the Mangs with the utmost vigilance in the clearest weather, but without finding them. If they were S.S.W. of Asuncion I should have been by the side of them on two occasions; and if they were N.N.W. of it, I have run over the spot twice.\*

"But in fact there are no such islands; nor have they ever had any existence either where they were supposed to be or within 30 miles of it! I am thoroughly satisfied that the name may be safely erased from the charts, and that no ship navigating in the vicinity of the Marianas will ever find them.

"This is not to assert that such islands have gone to the bottom like an old worm-eaten ship fallen to pieces, nor that they were clouds mistaken by those who saw them for islands. The Mangs do not and never did exist, for no other reason than that they and the Urracas are one and the same."

**PARALLOW DE PAJAROS** (called also GUY ROCK), the northernmost of the Mariana archipelago, was discovered by DOUGLAS, Sept. 11th, 1789;—he simply states—"at 6 P.M. saw a barren rock, which we called Guy's rock; it lies in lat. 20° 30' N., long. 145° 52' E." On the charts it used to be laid down as a reef with four or five rocks on or near it, but the voyage of the *Narvaez* showed it was really an island,—as much so as many of the smaller of the Marianas.



*Pajaros Island, bearing West, distant 17 miles. (Narvaez.)*



*Pajaros Island, bearing S.W., distant 5 to 6 miles. (Narvaez.)*

Pajaros island, about 24 miles N.N.W. from Urracas, is 2 miles long (East and West), and 1½ miles wide (North and South); it is a conical mountain, the summit of which is a volcano,—active at the time of the visit of the *Narvaez*, as thick black smoke was seen to issue from the S.W. side. Its height is from 1100 to 1200 feet, or about one-seventh of its breadth viewed from seaward.

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\* WILKES also says—"The passage between Grigan and Assumption is free from dangers, and I am well satisfied that no shoal exists where FREYCINET has laid down the Mangs, for we passed directly over the locality, and saw nothing of the kind. The Mangs (*i.e.*, the Urracas) were seen in their true position, to the northward of Assumption." (*United States' Exploring Expedition*, vol. v. p. 369.)

The South, East, and North sides are bold, perpendicular, and without any outlying dangers,—at least no break of the sea is seen except at the base of the cliffs. On the S.E. side there is a large rock, but it is connected with the island; near to this, but more to the southward, are three or four much smaller rocks, one of which is remarkable, as it resembles a pointed tower. Lastly, on the S.W. side there is another rock, close to the island, and not unlike that on the S.E. side.

Pajaros is precipitous on all sides except to the West, where the slope of the mountain is more gradual than in any other direction; but there does not appear to be any rock or bank on this side. Indeed, the vicinity of the island seems to be quite clean, and safe to approach within the distance of a mile. The *Narvaez* coasted the East, North, and West sides at a distance of from 1 to 2 miles, without perceiving any kind of danger,—which would certainly have shown had there been any, as there was a heavy swell on at the time; no anchorage was sought for, but if any exist it must probably be off the South or S.W. coast, where there are a few trees and some sparse vegetation; in every other direction Pajaros is as arid and barren as Asuncion island.

Pajaros island, far from being a rock to be avoided when navigating this part of the Pacific, is, like the Urracas, an excellent mark for determining a ship's position, being visible at a great distance, and its vicinity safe in any weather. The channel between the Urracas and Pajaros contains no known danger.

*Position*.—The centre of Pajaros is in about lat.  $20^{\circ} 30' N.$ , long.  $145^{\circ} 8\frac{1}{2}' E.$

## REPORTED ISLANDS, ROCKS, AND SHOALS

IN THE VICINITY OF THE MARIANAS;

BETWEEN LAT.  $12^{\circ}$  AND  $21^{\circ} N.$ , AND BETWEEN LONG.  $144^{\circ}$  AND  $147^{\circ} E.$

**SANTA ROSA shoal**.—This shoal is placed on the charts, and stated in sailing directions to be in lat.  $12^{\circ} 30' N.$ , long.  $144^{\circ} 15' E.$ ; the early notices respecting it are very vague, and it has not been reported by recent navigators in the vicinity of the Marianas. It dates from the time of DAMPIER, in 1686, who says (vol. i. p. 283): "the 20th day of May, our bark being about 3 leagues ahead of our ship, sailed over a rocky shoal, on which there was but 4 fathoms water; they imagined by this that the land was not far off, so they clapt on a wind with the bark's head to the north, and being past the shoal, lay by for us. . . . We were then in lat.  $12^{\circ} 55'$ , steering west. The island Guam is laid down in lat.  $13^{\circ} N.$  by the Spaniards, who are masters of it, keeping it as a baiting-place as they go to the Philippine islands. Therefore we clapt on a wind and stood to northward, being somewhat troubled and doubtful whether we were right, because there is no shoal laid down in Spanish drafts about the island Guam. At four a-clock, to our great joy, we saw the island Guam (bearing N.N.E.) at about 8 leagues distance." On p. 303 he adds,— "while we lay here the Acapulco ship arrived in sight of the island, but did not come in sight of us, for the gouverneur sent an Indian proe, with advice of our being here. Therefore she stood off to the southward of the island, and, coming foul of

the same shoal that our bark had run over, was in great danger of being lost there, for she struck off her rudder, and with much ado got clear; but not till after three days' labour. For tho' the shoal be so near the island, and the Indians go off and fish there every day, yet the master of the Acapulco ship, who should (one would think) know these parts, was utterly ignorant of it. This, their striking on the shoal, we heard afterward, when we were on the coast of Manila."

On CANTOVA's chart this shoal is laid down as extending E.N.E. and W.S.W., about 60 miles, and about half that breadth; also, on DALRYMPLE's chart, a bank said to have been discovered by GALVEZ in 1740, is laid down about 15 miles from the S.W. end of Guajan, in lat. 13° N.

The shoal mentioned by DAMPIER must, if it exists, be sought for more to the northward and eastward than the *assigned position* of the Santa Rosa shoal, for the following reasons. Comparing his log (which he gives us on page 286) with the text, he says the ships when past the shoal were in 12° 55'; they did not steer due North, but N.W. 7° W., making 8 miles of northing and 10 miles of westing, and then he places the ships in 12° 59' N.; he adds, "now the island Guam bore N.N.E. 8 leagues dist., this gives 22m. to my lat. and takes 9 from my meridian dist., so that the island is in lat. 13° 21'." He was reckoning the meridian distance West from cape Corrientes on the W. coast of America; now, from where the shoal was seen until he made the island, the easting and westing nearly cancel each other, and consequently the shoal would be on the meridian of the West side of Guajan (*i.e.*, in long. 144° 38' E.). Again, if DAMPIER's lat. is that of the S.W. end of Guajan, he made it 6' more to the North than its now assigned position, and consequently, the shoal is in lat. 12° 48' to 12° 46' N. Thus then the corrected position of the shoal is lat. 12° 47' N., long. 144° 38' E., or about 25 miles south of the island, but nearer still if DAMPIER's lat. is that of any more northerly point than the S.W. point, and which will agree better with *Indians going off and fishing there every day*, than if the shoal is placed in lat. 12½° N., long. 144¼° E.

The Acapulco galleon's losing a rudder on a shoal is, by DAMPIER's own showing, hearsay evidence; and there is nothing to indicate that it did not occur on the tail of the bank extending 2 or 3 miles S.S.W.-ward from the S.W. point of Guajan (*see* p. 79).

Why the shoal was named Santa Rosa is not stated;—perhaps from the hill near the north end of Guajan, or perhaps the Spanish galleon was called the *Santa Rosa*.

*Galvez' shoal* is most probably the same as that mentioned by DAMPIER, but it is certainly not as extensive as laid down on the chart of CANTOVA. KRUSENSTERN, in speaking of it, doubts its existence. The *Nurvaez*, bound from Manila to the Marianas, and then back to Manila, must, from the course taken, have passed over or very close to the assigned position; but no mention is made by the commander of any such shoal. It is placed on charts in lat. 13° 2½' N., long. 144° 21' E.

*Granger island*, reported in the *China Mail* in lat. 18° 58' N., long. 146° 14' E., is probably identical with Agrigan, then called Grigan island, in lat. 19° 49' N., long. 145° 40' E. (*see* p. 101); no island is known in the position assigned.

*Pajaros island* (of HORSBURGH's Directory, vol. ii.) in lat.  $22^{\circ} 20' N.$ , long.  $145^{\circ} 48' E.$ , is evidently the Farallon de Pájaros, *see* p. 107,—there being apparently a misprint, amounting to  $2^{\circ}$  of latitude, and a small error in the longitude.

#### VOLCANO AND ARZOBISPO OR BONIN ISLANDS.

**GENERAL REMARKS.**—Spanish navigators as early as the sixteenth and seventeenth centuries were aware of the existence of several islands considerably to the northward of the Marianas; and they were afterwards noted on all the charts of the Acapulco galleons, and on those of ESPINOSA. One linear group, on the old charts, near the meridian of  $142^{\circ}$  (E. of Greenwich) runs N. and S., from lat.  $24\frac{1}{2}^{\circ}$  to  $28^{\circ} N.$ , and the islands are named in succession, from the southward,—Volcan San Augustin, Fortuna, San Alexandro, and Is. del Arzobispo. Another group, stretching N.N.E. and S.S.W., is placed nearly on the meridian of the northern islands of the Marianas, then considered to be in  $148^{\circ} E.$ ; these islands range between lat.  $23\frac{1}{2}^{\circ}$  and  $28^{\circ} N.$ , and are named in succession,—Volcan San Dionisio, Volcan, Volcan Grande, Volcan San Francisco, los Patos, Volcan San Antonio, and Malabrigo.

Taking into account the many different positions (at least as regards longitude), in which the same island in those early days of navigation would be placed, and viewing the subject in the light of to-day, it may safely be concluded that the two linear groups, which on the old Spanish charts are six degrees of longitude apart, represent but one such group, now known as the Volcano, and the Arzobispo or Bonin islands;—the similarity in some of the names, the physical character of some of the islands, and their approximate N. and S. extension, all point to this,—while, by a singular coincidence, the position assigned to the first (or more westerly) linear group is not greatly erroneous.

**VOLCANO islands.**—These islands—three in number—were discovered and named by BERNARDO DE TORRES in 1543. They were seen by the *Resolution* and *Discovery* (COOK's ships) in 1779, and KING says,—“Nov. 14th, saw land appearing like a peaked mountain, and bearing S.W.; at noon, lat. by obs.  $24^{\circ} 37' N.$ , long.  $142^{\circ} 2' E.$ ; the land, which we now discovered to be an island, bore S.W.  $\frac{1}{2} W.$ , distant 8 or 10 leagues; and at 2 P.M. we saw another to the W.N.W. This second island, when seen at a distance, has the appearance of two; the south point consisting of a high conical hill, joined by a narrow neck to the northern land, which is of moderate height. As this was evidently of greater extent than the island to the south, we altered our course toward it. At 4 P.M. it bore N.W. by W., but not having daylight sufficient to examine the coast, we stood upon our tacks during the night. On the 15th, at 6 A.M. we bore away for the south point of the larger island, at which time we discovered another high island, bearing N.  $\frac{3}{4} W.$ , the south island being on the same rhumb-line, and the south point of the island ahead, W. by N. At nine, we were abreast, and within a mile of the middle island, but Capt. GORE, finding that a boat could not land without some danger from the great surf that broke on the shore, kept on his course to the westward. At noon, lat. by

obs.  $24^{\circ} 50' N.$ , long.  $140^{\circ} 56' E.$ " The southern island was seen by the Spanish corvette *La Concepcion* in 1804, and the group was visited by KRUSENSTERN in 1805.

**San Augustin** or **San Dionisio**—the southernmost island of the group—is a single hill of a square form, flat at the top, and about 400 feet high. KRUSENSTERN, who was near it for two days, placed it by his observations in lat.  $24^{\circ} 14' N.$ , long.  $141^{\circ} 20' E.$  This longitude agrees with that given by KING, who, however, makes the lat.  $8'$  more to the North, but it must be remembered he only saw the island from a considerable distance.

**Sulphur island**, the central one of the group—is "5 miles long, in a N.N.E. and S.S.W. direction. The South point is a high barren hill, flattish at the top, and when seen from W.S.W., presents an evident volcanic crater. The earth, rock, or sand, for it was not easy to distinguish of which its surface is composed, exhibited various colours, and a considerable part we conjectured to be sulphur, both from its appearance to the eye, and the strong sulphureous smell which we perceived as we approached the point. Some of the officers on board the *Resolution*, which passed



*Sulphur Island, bearing E.N.E. (King.)*

nearer the land, thought they saw streams rising from the top of the hill. From these circumstances Capt. GORE gave it the name of SULPHUR island. A low narrow neck of land connects this hill with the South (? North) end of the island, which spreads out into a circumference of 3 or 4 leagues, and is of moderate height. The part near the isthmus has some bushes on it, and has a green appearance on it, but those to the N.E. are barren, and full of detached rocks, many of which were exceedingly white. Very dangerous breakers extend  $2\frac{1}{2}$  miles East, and 2 miles West, off the middle part of the island, on which the sea broke with great violence." (KING in COOK's *Voyages*, 1779).

Capt LOPEZ, of the whale ship *Napoleon III.*, says there is "a reef 4 miles east of Sulphur island,"—which, however, may be identical with that mentioned by KING.

The position of Sulphur island, according to KING (which agrees with that of KRUSENSTERN), is lat.  $24^{\circ} 48' N.$ , long.  $141^{\circ} 12' E.$ \*

Sulphur island is probably the Volcan Grande of the old Spanish charts.

**San Alexandro**, the northernmost island, is, like the southern one, "a single mountain of considerable height, peaked, and of a conical shape," in lat.  $25^{\circ} 14' N.$  long.  $141^{\circ} 10' E.$  (KING).

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\* It is probable that the longitude of these islands, as given by KING, is from  $3'$  to  $4'$  too far East, inasmuch as he placed the Pratas, the Great Ladrone and Macao, from  $7'$  to  $15'$  too far East. He made Sulphur island Nov. 15th, and was at the Pratas Nov. 28th.

**ARZOBISPO or BONIN Islands.**—These islands consist of three groups or clusters lying nearly N. and S., between lat.  $26^{\circ} 30'$  and  $27^{\circ} 45' N.$  As before observed, the former name (Is. del Arzobispo) appears on the old Spanish charts in about lat.  $27^{\circ} N.$ , long.  $142^{\circ} E.$ , and this coincides with the position of the islands now very generally known under the name of Bonin. The time and circumstances of the discovery by the Spaniards are uncertain. They are probably the islands referred to by KÄMPFER in his "Account of Japan," as follows:—"about the year 1675, the Japanese accidentally discovered a very large island, one of their barks having been forced there in a storm from the island Fatsissio, from which they computed it to be three hundred miles distant towards the east. They met with no inhabitants, but found it to be a very pleasant and fruitful country, well supplied with fresh water, and furnished with plenty of plants and trees, particularly the arrack (areca?) -tree, which however might give room to conjecture that the island lay rather to the south of Japan than to the east, these trees growing only in hot countries. They called it Bune-sima (Munin-sima? uninhabited islands) because they found no inhabitants upon it. On the shores they found an incredible quantity of fish and crabs (turtle?), some of which were from four to six feet long." This description agrees tolerably well with the physical character of the Bonin islands as given by Capt. BEECHY, R.N., and Commodore PEREY, U.S.N.

In 1823-4 Capt. COFFIN visited the southernmost group; in 1825 the English ship *Supply* called at the central group; in 1826 the whaler *William* drove ashore on Peel island; and in 1827 they were examined and formally taken possession of by Capt. BEECHY, H.M.S. *Blossom*, who remarks that they "correspond so well with a group named Islas del Arzobispo in a work published many years ago in Manila, entitled 'Navegacion Especulativa y Practica,' that I have retained the name in addition to that of Bonin islands." They were subsequently visited and examined by the Russian Admiral LUTKE in 1828, and by Commodore PEREY, U.S.N., in 1853.

**COFFIN group**, called **Bally** by BEECHY.—The islands of this group are the southernmost of the Bonin islands, and their position was first communicated to this country by Capt. COFFIN, a whaler, who brought up there in 1823. A reconnaissance of them was made by the officers of the U.S. ship *Plymouth*, one of the Japan Squadron, in 1853.

"**Ellsborough**, formerly known as Fisher island, the largest of the Coffin group, is  $7\frac{1}{2}$  miles in length, by about  $1\frac{1}{2}$  in breadth, and 1471 feet high. The greater portion of it is rocky and hilly, and unsuited for agricultural purposes. That portion of it which could be cultivated is a black loam, and produces sweet potatoes, yams, taro, and Indian corn, bananas, pine-apples, water-melons, and limes. Sweet potatoes form the staple support of the few inhabitants of the island. I could discover no minerals. There are several varieties of timber suited for mechanical and ornamental purposes. The only animal on the island is the wild hog. Fish are abundant and of excellent quality. Humpback whales resort to these islands from November till May, during which time they are calving. Turtles are found in abundance in season, and are salted down by the inhabitants in lieu of beef." Lieut. G. B. BALCH, U.S. Navy.

Close to the northernmost point of Hillsborough island is Devil rock, from which a reef stretches nearly a mile to the N.W.-ward. At the distance of  $\frac{1}{4}$  of a mile S.W.-ward of the rock, is the N.W. point of the island, off which is Sugarloaf rock, with dangerous rocks and reefs stretching some distance seaward. On the west side of the island, midway between its extreme points, are two small indentations in the coast-line, off which are two small islets. Half a mile to the southward of the southern indentation is Pyramid rock, close to the shore: nearly a mile S.W.-ward from the Pyramid is Painted rock,  $\frac{1}{4}$  of a mile from the coast,—the intervening area being encumbered by rocks (one of which is arched) and by reefs; these form part of the northern boundary of **New-port**,—an open bay on the west side of Hillsborough island, near its south end.

Stretching to the S.W.-ward from the S.W. point of Hillsborough island is a continuous line of reefs and islets, terminating in a long but narrow island; the outermost extreme of this island with its outlying reefs is  $2\frac{1}{2}$  miles from the S.W. point of Hillsborough; thence a rocky patch trends to the N.W.-ward, in the direction towards **Mid-Channel** rock, which rock is also surrounded by rocky patches;  $\frac{1}{2}$  a mile to the northward of Mid-Channel rock is **Plymouth** island, which is a mile long, N.N.E. and S.S.W., and  $\frac{1}{2}$  a mile wide. Plymouth island fronts and partially shelters New-port; the channel between it and the main island (Hillsborough) on the north is deep and  $1\frac{1}{2}$  miles wide;—that to the south, between Plymouth island and Mid-Channel rock, is less than  $\frac{1}{2}$  a mile in width, but safe (having 10 fathoms) by not borrowing too much towards the rock. Whether the channel between Mid-Channel rock and the island to the S.E.-ward is accessible is uncertain,—it appears by the chart to be considerably encumbered with rocky patches which narrow the passage.

To the S.S.E. of Hillsborough island, at the distance of 3 miles, is **Kelly** island, 1 mile long E. and W., and  $\frac{1}{2}$  a mile wide. To the N.E.-ward of Kelly island, at the distance of  $\frac{1}{2}$  a mile, is another small island, with a reef off its east extremity. Several islets and a reef of rocks also stretch some distance northward from the N.W. point of Kelly island to the centre of the easternmost island, making the channel between the two impassable. Off the west end of Kelly island there is a small rock, and the depth is 25 fathoms.

West of Kelly island, at the distance of two miles, is **Perry** island,  $1\frac{1}{2}$  miles long N.E. and S.W., and about  $\frac{1}{2}$  a mile wide. The channel between Perry island and the island to the north is a mile wide; the islets (**Weedles**) in the channel near the north side of Perry island, have rocky patches around them; there is also a rocky patch  $\frac{1}{2}$  of a mile S.E.-ward from Perry island, opposite two rocks near the shore.

**New-port**.—"With the exception of New-port, and a small cove just to the northward of it, there is no place on the shores of any of the islands suitable for a coal depôt; nor can New-port or the cove be recommended as places suitable for such a purpose. They are both open from S.W. to N.W., and the holding ground is not good, being sand and rocks. Vessels could, however, always get to sea on the approach of a gale, as there are two safe passages, which are very plain." (Lieut. BALCH, U.S.N.) The harbour is 2 miles wide from the main coast to the N.E. end of Plymouth island, and in the centre there appears to be no bottom with 24 fathoms;

the U.S. ship *Plymouth* anchored  $\frac{1}{2}$  a mile from the upper end of the harbour, in about 12 to 13 fathoms water.

"Wood can be procured on Hillsborough island. Water can be had in sufficient quantity, and of good quality; a small stream near the head of the cove furnishes an ample supply, but it would be necessary to roll casks to the stream, or convey the water to the boats by a hose or pipes, which could easily be done."

**TIDE.**—It is high water at New-port at F. and C. at 11h. 32m., and the rise of tide is  $3\frac{1}{2}$  feet.

**Position.**—The anchorage at New-port is in lat.  $26^{\circ} 36' N.$ , long.  $142^{\circ} 12' E.$ , (see note, p. 118.)

**BEECHY group**, the central one and largest of the Bonin islands, lies 20 miles to the northward of Hillsborough island,—the channel between the two groups being perfectly safe. This group consists of three islands and several islets extending  $10\frac{1}{2}$  miles in a N. and S. direction; of these Peel island is the southernmost and largest, the next is named Buckland, and the northernmost Stapleton. They are high, bold, and rocky, and evidently of volcanic formation. They are green with verdure and a full growth of tropical vegetation, which crowds up the acclivities of the hills from the very borders of the shore, which is here and there edged with coral reefs. The headlands and detached rocks have been thrown by former convulsions of nature into various grotesque forms, which assume to the eye the shape of castle and tower, and strange animals of monstrous size and hideous form. Numerous canal-like passages open in the sides of the rocky cliffs, which have almost the appearance of being hewn out with the chisel, but which have evidently been formed in the course of volcanic changes, when the rock flowed in liquid lava, and found issue in these channels, which the torrents that come down the sides of the mountains in the rainy season toward the sea have worn smooth by constant attrition. Some of these dykes, or canal-like passages, less affected by time and the washing of the water, still retain their irregular formation, which has so much the appearance of steps that the observer, as he looks upon them, might fancy they had been cut by the hand of man in the solid rock, for the purpose of climbing the mountain. (Commodore PERRY.) "The three islands are separated by channels so narrow that they can only be seen when abreast of them; neither of them is navigable by shipping,—the northern, on account of rocks which render it impassable even by boats,—and the other on account of rapid tides and eddies, which, as there is no anchoring ground, would most likely drift a ship upon the rocks. . . . The islands have deep water all round them, and ships must not allow their safety to depend upon the lead, for although the bottom may be gained at great depths between some of the islands, yet that is not the case in other directions." (BEECHY.)

**Peel island** is  $4\frac{1}{2}$  miles long, and tolerably high—the hills rising in some places by gentle slopes, in others abruptly by steep ascents; the elevation of the *paps* near the north end is respectively 879 and 886 feet. Almost every valley has a stream, and the mountains are clothed with trees among which the *areca oleracea* and fan palms are conspicuous. The volcanic origin of the island is clearly manifest from the existence of ancient craters, and basaltic dykes passing through beds of sand, scoria, and cinders.

The island has been inhabited since 1830, when Messrs. MILLICHAAMP and MOZARO established themselves there with a small colony of men and women from the Hawaiian islands, and their numbers have since been augmented from passing vessels and from several of the Pacific islands. Not the least vestige of previous occupancy has been discovered by the present settlers, who have examined every part of the island.

The rocks constituting the island are chiefly volcanic (trap and basalt) and the soil (which is thick) is a dark vegetable mould; it is in good cultivation, and produces with little labour Indian corn, sugar-cane, sweet potatoes, taro, yams, peas, beans, water melons, pumpkins, onions, turnips, radishes, and other vegetables,—and fruits of various kinds. Sheep, deer, pigs, fowls, ducks, and geese are in great abundance. Wild hogs and wild goats are numerous, as are also jungle fowl. There is an infinite number of cats and dogs, but no noxious animals, nor snakes, nor rats, but many mice. Shark are numerous but small. The neighbouring waters abound with excellent fish, which may be taken by hook or net, but the variety is not great. Commodore PERRY left some bullocks.

**SUPPLIES.**—The season for planting at the Bonin islands is in the months of March and April, but ships calling can at all seasons procure a supply of potatoes, yams, onions, pigs, goats, fowls, and fish. Turtle may be had from February until August inclusive; they begin to lay their eggs in May, and continue to lay until August, after which time the females leave the islands,—the males having left five or six weeks before; the females lay from 200 to 300 eggs each, according to their age, and at two different layings. Indian corn, pumpkins, and water melons begin to ripen about the end of May. The settlers have put hogs, goats, and deer upon some of the islands, and they are increasing rapidly. (COLLINSON, 1851).

Wood is good and plentiful, but none fit for masts: one sort, called *tomana*, is used for flooring and planking. The mulberry-tree is very hard, and is used for posts and stanchions. There is also a small quantity of sandal wood.

**WINDS.**—The prevailing winds from April to October are from N.E. to S.E.; and from November to March, N.W. to S.W.; but they do not blow with the regularity of the Trade-wind or Monsoons. The strongest gales occur in May and October, beginning at S.E., and blowing hard for about four hours they chop suddenly round to the westward: they are not regular, that is to say, three or four years sometimes pass without any bad weather being experienced in these months. In December, January, and February gales of wind occur from West to N.W.; the westerly winds are then generally fresh.

Typhoons in July, August, September, and October; greatest strength in October.

Showers are more or less frequent from February to June; heavy rains in July and August. Fogs are also prevalent in the summer, with easterly winds. BEECHY was there in June, and he says the weather was fine, but oppressively warm; and though they had no rain, the atmosphere was generally saturated with moisture. There was a thick fog to windward of the islands almost the whole time; but it dispersed on its passage over the land, and the lee-side was generally clear.

Off the S.W. end of Peel island is ~~Knorr~~ island, with several islets and rocks in its vicinity, and northward of Knorr island are the conspicuous ~~Sail~~ rocks, 60 feet high:  $1\frac{1}{2}$  miles northward of Sail rocks is the entrance to Port Lloyd.

The promontory stretching from the N.W. end of Peel island, and forming the north and west sides of Port Lloyd, is 739 feet high towards its centre, and 594 feet towards its southern end. The seaward shores are bold and perpendicular. Westward (southerly) of the latter summit a reef extends out to the distance of  $1\frac{3}{4}$  cables from the shore; and rather more than a cable's length to the northward of this, and at the distance of 2 cables from the shore, is an outlying rocky patch having only 6 to 8 feet water on it, with deep water all round. There is also a reef of rocks off the N.W. point of Peel island.

**Port Lloyd.**—This harbour has its entrance conspicuously marked by a bold high promontory (Southern head, 492 feet high\*) on the southern side, and a tall quoin-shaped rock (Square rock, 260 feet high) on the northern side. It is nearly surrounded by hills, and it would appear to have been at one time the crater of an active volcano, from which the surrounding hills had been thrown up, while the present entrance to the harbour was formed by a deep fissure in the side of the cone, through which a torrent of lava had poured into the sea, leaving, after its subsidence, a space into which the waters subsequently were emptied, bringing with them their usual deposits, which, together with the coral formation, now form the bottom and sides of the harbour.

At the upper part of the port there is a small basin, formed by coral reefs, kept open by streams of water running into it, and which, in consequence of there being 10 fathoms water all over it, BEECHY named *Ten-fathom Hole*; it is conveniently adapted for heaving a ship down, and on the whole a most desirable place of resort for a whale ship.

In most of the small bays in the harbour there are coral reefs and ledges.

Two cables S.E.-ward from Square rock, and 3 cables southward of the rocky head on the north side of entrance, are two dangerous shoal patches, steep-to, and awash with a smooth sea; they can be easily seen from aloft, however, even when there is no swell on. There is also a coral rock about a cable's length north from the northern point of Southern head, on which are 8 feet water, and there are breakers 3 cables southward of the south side of the same head. Southern head is an island at high water.

**DIRECTIONS.**—"Having ascertained the position of Port Lloyd, steer boldly in for the *Southern head*, taking care



\* On Southern head there is a curious natural cave or tunnel which passes through the basaltic rock from the head to the beach on the other side. The entrance has a width of about

when approaching from the southward, *not to bring it northward* of N.E.  $\frac{1}{4}$  E., nor shut it in with two paps on the north-east side of the harbour, and which will be seen nearly in one with it on this bearing. *In this position they are a safe leading mark*; to the southward of this line there is broken ground.

"In a sailing vessel, if the wind be from the southward, which is generally the case in the summer season, round the Southern head at the distance of a long cable's length, *close to a sunken rock*, which will be distinctly seen in clear weather. Keep fresh way upon the vessel, in order that she may shoot through the eddy winds, which baffle under the lee of the head, and to prevent her coming round against her helm, which would be dangerous. She will at first break off, but will presently come up again; if *not*, be ready to go about, as the vessel will be close upon the reefs to the northward, and the helm must be put down *before the south end of Goat island*, off the port to the N.W.-ward, comes on with the west side of Square rock.

"If the vessel comes up, steer for a high Castle rock, at the eastern part of the port, until a Pointed rock (white on top with bird's dung, and looks like an island) on the sandy neck eastward of Southern head, comes in one with a high sugarloaf-shaped grassy hill southward of it; after which, bear away for the anchorage, taking care not to open the sugarloaf again to the westward of Pointed rock. The best anchorage (Ten-fathom Hole excepted) is at the northern part of the port, where the anchor is marked on the Admiralty plan.

"*In anchoring*, take care to avoid a spit extending off the south end of the small island (North rock) near Ten-fathom Hole, and not to shoot so far over to the western reef as to bring a rock at the outer foot of Southern head in one with some black rocks,\* which will be seen near you a short distance to the south-westward. The depth will be 18 to 20 fathoms, clay and sand. The anchorage is fair, though open to the south-west.

"If the wind be from the northward, turn to windward between the line of the before-mentioned Sugarloaf and Pointed rock (westward), and a north and south line from Castle rock to the eastward. This rock, on the western side, as well as the bluff to the northward of it, may be passed *close to*, if necessary. The hand lead will be of little use in beating in, as the general depth is 20 or 24 fathoms." (BEECHY, 1827.)

ANCHORAGE.—Port Lloyd is easy of ingress and egress, and may be considered safe and commodious, though of deep anchorage. Vessels usually bring up in from 18 to 22 fathoms. The safest position is to be found as high up the harbour as a ship can conveniently go, having regard to depth and room for swinging, and veering cable. If intending to bring up in Ten-fathom Hole, you must warp into it.

Capt. COLLINSON, R.N., who visited Port Lloyd in 1851 (April-May), remarks, "that in making the island from the southward, he experienced a difficulty in discovering the remarkable quoin mentioned by Capt. BEECHY as the mark for the harbour on the south side, being under the shadow of the high land at the back.

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15 feet, and a height of 30, but the roof within soon rises to 40 or 50 feet, where it has so much the appearance of artificial structure that it may be likened to a builder's arch. There is sufficient water for a boat to pass from one end to the other.

\* These black rocks are on the west side of the harbour.

No difficulty, however, can be experienced by a stranger making the harbour from the southward, as the bold bluff on the south side is sufficiently remarkable, and the two paps which Capt. BEECHER gives as a leading mark for clearing the rocks outside the harbour will sufficiently denote its position: besides that, among the detached rocks to the southward, are two pinnacles, and over the 'remarkable quoin,' on the north side as you enter, is a triple peak. We shot in close under the bluff, but did not see the shoal off it (it will not do therefore for vessels to trust to the eye to pick this danger up), and then had baffling winds until we opened South bay, when we edged away to the North, and came to off the entrance to Ten-fathom Hole in 25 fathoms;—a better berth will be found a cable's length closer to the reef on the west side."

Messrs. MADIGAN and BENNETT, U.S. ships *Saratoga* and *Susquehanna*, append the following note (1853) to Capt. BEECHER's directions:—"The entrance to the harbour of Port Lloyd is well defined, so that it can scarcely be mistaken. A ship bound in would do well to place a boat on the shoal that makes off south from the eastern point of Square rock. The anchorage is fair, though open to the south and west."

COLLINSON, on leaving the harbour, says—"We were detained a day by strong southerly winds which prevented our warping to where we could have fetched out from,—and eventually we got away with a westerly wind, rounding the 2-fathom patch close, and then barely fetching clear of the rocks off Southern head, owing to the tide setting strong across the entrance of the harbour (last quarter flood). In consequence of the baffling winds vessels should always have their boats in readiness to tow."

*Earthquakes* are not unfrequent at the Bonin islands, and a report in 1859 represented the entrance to this harbour to be partially obstructed by upheavals; it may have been an interested report.

TIDES.—It is high water at F. and C. at 6h. 8m.; and the rise of tide is 3 feet.

WATER.—Fresh water may be obtained from a sandy bay on the east side of the harbour; but the casks have to be taken out of the boat unless you are possessed of a hose 300 feet long. The best watering-place is in Ten-fathom Hole. The U.S. squadron report the water "tainted by the coral rocks from which it springs."

The dwellings of the inhabitants and the cultivated ground are on the west side of the port, and at the upper end of Ten-fathom Hole.

*Position*.—Port Lloyd is in lat.  $27^{\circ} 5\frac{1}{2}'$  N., long.  $142^{\circ} 14'$  E.\*

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\* The longitude of these islands is tolerably well established; BEECHER made Port Lloyd to be in  $142^{\circ} 11\frac{1}{2}'$  E., his meridian distance being measured from Abbey point, Nafa road, Lu-chu, which he placed in long.  $127^{\circ} 42' 20''$  E. The master of the U.S. ship *Susquehanna* (Commodore PERRY's Expedition), from the same position, made it 5' further East, or in long.  $142^{\circ} 16\frac{1}{2}'$  E. But the mean of seven meridian distances, between Nafa and Hong Kong, places the former in long.  $127^{\circ} 40' 3''$  E., or  $2' 17''$  more westerly than the determination of BEECHER; correcting therefore the above longitudes, they become respectively  $142^{\circ} 9' 13''$  and  $142^{\circ} 14' 13''$ . Lieut. RODGERS of the U.S. ship *Vincennes* (in 1854), running from Hong Kong, made the long.  $142^{\circ} 13\frac{1}{4}'$ , and COLLINSON (1852) with 5 chronometers, 33 days from Hong Kong, made it in long.  $142^{\circ} 15'$  E.

The mean of the four positions is long.  $142^{\circ} 13'$  E., or, rejecting BEECHER's, long.  $142^{\circ} 14'$  E., and probably correct within 1' of longitude.

**Fitton bay** at the S.E. angle of Peel island, enclosed by perpendicular rocks, is  $1\frac{1}{2}$  miles deep, and nearly a mile wide at the entrance; there is anchorage at the upper end in 17 fathoms, sand, at the distance of 2 cables from the shore, secure from all winds except those from S.E.; as this is the prevalent wind during summer, it is not advisable to anchor there in that season. On the north side of entrance there is a large and conspicuous islet (lat.  $27^{\circ} 3' N.$ ) connected to the north bluff of the bay by a reef on which are several small rocks. Outside the harbour there are also some sunken rocks to the southward of the entrance, on which account ships should not close the land in that direction, so as to shut in the two paps (at the N.E. angle of Port Lloyd) with the south bluff of the bay; with these objects open there is no danger. (BEECHY). At the upper end of the bay, on the west side, there is a small and narrow cove, with 6 fathoms water at the entrance.

Fitton bay is frequently visited by whalers for wood and water.

From a point on the east side of Peel island a reef of rocks stretches to the northward, terminating at a small islet in lat.  $27^{\circ} 5\frac{1}{2}' N.$ ;  $\frac{1}{2}$  of a mile to the N.W.-ward of the islet is a detached patch and rock. As before observed the *channel between Peel island and Buckland island* (to the northward) is *unsafe*. Nearly fronting this channel (1 mile westward of the west entrance) is **Goat island**, in lat.  $27^{\circ} 7' N.$ , about 300 feet high, in the vicinity of which are several rocks and small islets;  $\frac{1}{2}$  of a mile to the southward of Goat island there is also a small group of very low islets (called Low islands).

**Buckland island**, to the north of Peel island, and the central one of Beechy group, is  $3\frac{1}{2}$  miles long N.W. and S.E. At the S.W. angle of the island (close to the opening of the channel between it and Peel island) is a small sandy bight named **Walker bay**, in which ships will find good anchorage; but they must be careful in bringing up, to avoid being carried out of soundings by the current. The islet on the west side of this bay is connected to the main by a reef. Westward of the west point of Buckland island, and  $\frac{1}{2}$  of a mile N.W.-ward of the islet just mentioned, is **Little Goat island**, which is also connected to the main by a reef. The channel between Goat island and Little Goat island is over  $\frac{1}{2}$  a mile wide, and safe by not borrowing too much towards either side.

**Stapleton island**, the northernmost of the Beechy group, is, like the others, of volcanic origin. It has a varied surface of plain, hill, and valley, with large tracts of fertile lands. There is a *small bay on the western side* with apparently deep water, and surrounded by rocks and mountains varying from 800 to 1500 feet in height, which protect it from the S.E. typhoons. A small promontory and coral reef divides this bay, and on the land bordering the northern section is a spring of cool, well-tasting water, coming out of a rock and giving a supply of nearly three gallons per minute. The indigenous productions of Stapleton island are the same as those on the other islands, but the goats introduced there have increased marvellously, and become very wild in the course of their undisturbed wanderings through the secluded ravines and over the savage rocks of the island. There is a small islet off the north end of Stapleton island.

**DIRECTIONS.**—Sailing from Nafa (Lu-chu Is.) for the Bonin group during the

N.E. Monsoon, it is better to double round the south end of the island, in order to avoid beating through the Montgomery group; but with a southerly wind and pleasant weather a vessel will find it to her advantage to pass round the north end, where she will feel the influence of the Kuro-siwo, which she may carry well to the eastward of her course to the Bonins.

**KATER** island, the north extreme of which is in lat.  $27^{\circ} 29\frac{1}{2}'$  N., long.  $142^{\circ} 14\frac{1}{2}'$  E. (*see note*, p. 118), lies in the channel between Beechey group and Parry

The Ears,  
N.N.E. 3 miles.



*Kater Island. (Beechey.)*

group—the next group to the northward. It is about  $1\frac{1}{2}$  miles long N.W. and S.E., and there are rocks in its vicinity in every direction. The “Ears” is a conspicuous islet on its S.W. side.

**PARRY** group, the northernmost of the Bonin islands, extends 9 miles in a N.W. by N. and S.E. by S. direction. It consists of several small islets, in the



*Parry Group, N. 5 leagues. (Beechey.)*

vicinity of which are many pointed rocks, with much broken ground round about, rendering caution necessary in approaching it. The N.W. island is in about lat.  $27^{\circ} 43\frac{1}{2}'$  N., long.  $142^{\circ} 10\frac{1}{2}'$  E. (*see note*, p. 118). But the charts place islets and rocks 1 mile further north and 3 miles further west.

*Caution.*—When in the vicinity of all the Bonin islands the navigator must exercise considerable caution, for the winds and the current are alike uncertain. BEECHEY says, “We stood off and on for the night with very thick weather; and at daylight, when by our reckoning the ship should have been 7 miles from the land, we unexpectedly saw the rocks beneath the fog, about  $\frac{1}{2}$  of a mile distant, and had just room to clear them by going about. The depth of water at the time was 60 fathoms; so that had it been blowing strong and necessary to anchor, there would have been but an indifferent prospect of holding on any length of time. The great depth of water, and the strong currents which set between the islands must make the navigation near them hazardous during thick weather. On the evening preceding this unexpected event, we found so strong a current setting to the S.W., to windward, that, though the ship was lying-to, it was necessary frequently to bear away, to prevent being drifted upon the land.”

**ROSARIO** island, about 70 miles W. by N. from Peel island (Bonin group), was probably seen by the *Nautilus* in 1801 and named DISAPPOINTMENT island; it was also seen by the Spanish corvette *La Fidelidad* in 1813. It has since been examined by Commodore PERRY and Lieut. RODGERS of the U.S. Navy.

The island is about  $\frac{1}{2}$  of a mile long (N.E. by N. and S.W. by S.), and the highest point, near the centre, 148 feet. Around it are several detached rocks, two of which



*Rosario Island,  $\frac{1}{2}$  mile dist. to the S.E.-ward. (Rodgers, U.S.N.)*

are a short distance off its extreme points; and a reef extends  $\frac{1}{2}$  of a mile to the southward of the southernmost one. It is of volcanic formation, bold, broken, rugged, generally barren, and apparently unsusceptible of cultivation, but there are some



*Rosario Island, 10 miles distant. (Rodgers, U.S.N.)*

small patches of green about the top. The surf breaks heavily all around it and landing is impracticable. From a distance of 10 miles it appears as two islands.

RODGERS found the current running  $\frac{1}{2}$  mile per hour, easterly.

**Position.**—By QUIN (H.M.S. *Raleigh*, 1837), lat.  $27^{\circ} 13' N.$ , long.  $140^{\circ} 46' E.$ ;—by PERRY, lat.  $27^{\circ} 14' 30'' N.$ , long.  $140^{\circ} 56' 45'' E.$ ;—by RODGERS, lat.  $27^{\circ} 15' 32'' N.$ , long.  $140^{\circ} 52\frac{1}{2}' E.$  The latter is probably most correct, the mean of the three being  $27^{\circ} 14\frac{1}{2}' N.$ , long.  $140^{\circ} 51\frac{1}{2}' E.$ , which agrees closely with RAPER's assignment: this is 16' eastward of the old Spanish determination.

**BORODINO islands.**—These were discovered by Lieut. PONAFIDIN in 1820, and placed by him in lat.  $25^{\circ} 56' N.$ , long.  $131^{\circ} 15' E.$

The two islands, nearly 5 miles apart, lie in a N.N.E. and S.S.W. (? N.E. and S.W.) direction. They appear to be of coral formation but of great antiquity, as trees of considerable size crown the uplands, the most elevated parts of which may be 40 feet above the sea-level. The navigation in the immediate neighbourhood seems free from danger, but no indications were seen in the surrounding shore which might afford safe anchoring places. No signs of inhabitants were discovered. (PERRY, U.S. Navy).

N.  $63^{\circ} E.$       N.  $70^{\circ} E.$       N.  $80^{\circ} E.$       S.  $70^{\circ} E.$



*N. Borodino,  $13\frac{1}{2}$  m. dist.*

*S. Borodino, 6 miles dist. (Rodgers, U.S.N.)*

The northern island is 3 miles long; the southern and larger one, 4 miles long, has a reef extending along its southern shore. It has been asserted, but on insufficient evidence, that these are the Grampus islands of MEARES.

*Position.*—PERRY made the south extremity of the southern island in lat.  $25^{\circ} 47' N.$ , long.  $131^{\circ} 19' W.$ ; RODGERS made the centre of the N. island in lat.  $25^{\circ} 59' 38'' N.$ , long.  $131^{\circ} 21\frac{1}{2}' E.$ ; and the centre of the S. island in lat.  $25^{\circ} 52' 45'' N.$ , long.  $131^{\circ} 14\frac{1}{2}' E.$

*Amsterdam island*, in lat.  $25^{\circ} 20' N.$ , long.  $131^{\circ} E.$ ; an *island*, in lat.  $25^{\circ} 10' N.$ , long.  $131^{\circ} 30' E.$ ; *Cooper island*, in lat.  $26^{\circ} N.$ , long.  $131^{\circ} 48' E.$ , and in lat.  $26^{\circ} 6' N.$ , long.  $132^{\circ} 10' E.$ , all whalers' reports, most probably refer to Borodino islands, seen at a distance.

*Bishop reef*, reported by Capt. BISHOP of the *Nautilus* in 1796, in lat.  $25^{\circ} 20' N.$ , long.  $131^{\circ} 15' E.$ , has not been seen since, and its position was passed over by Lieut. RODGERS (U.S.), in which case he must have also passed over the position of Amsterdam island, &c. (*see above*).

*Shoals and Reefs.*—A reported shoal in lat.  $26^{\circ} 58' N.$ , long.  $131^{\circ} 36' E.$ , was sought for and its position passed over by the *Viscount Sandon* in 1850. Also *shoals or reefs* in lat.  $25^{\circ} 5' N.$ , long.  $130^{\circ} 30' E.$ ; in lat.  $23^{\circ} 20' N.$ , long.  $131^{\circ} 10' E.$ ; and in lat.  $23^{\circ} 10' N.$ , long.  $130^{\circ} 50' E.$  are known only by the single report.

**RASA island** was seen by the French frigate *La Canonnière* in 1807, and by the Spanish frigate *Magallanes* in 1815,—the latter giving it the name *rasa*, signifying *flat*. It was stated to be 4 or 5 miles long N.W. and S.E., low, covered with bushes, and surrounded with rocks; and in lat.  $24^{\circ} 27' N.$ , long.  $130^{\circ} 40' E.$  Capt. J. B. STEELE, of the *Sebastian Cabot*, passed over this position in June, 1867, and saw no island;—indeed, there is every probability of its being much further to the eastward.

(1) The whaler *Aurora* reported an island, in lat.  $24^{\circ} 29' N.$ , long.  $131^{\circ} 12' E.$ ; (2) Capt. NORVILLE, of the *Argyle*, an island in lat.  $24^{\circ} 23' N.$ , long.  $131^{\circ} E.$ ; (3) Capt. HENRY, an island in lat.  $24^{\circ} 2' N.$ , long.  $131^{\circ} 12' E.$  (4) The *Lancashire Witch* passed within 7 miles of Rasa island in 1856, and the position determined from the observations of Mr. W. SYMINGTON,\* chief officer, placed it in



*Rasa Island. Centre bearing S.S.E., distant 10 miles.*

lat.  $24^{\circ} 26' N.$ , long.  $131^{\circ} 5\frac{1}{2}' E.$  (5) The master of the *Groningen*, in 1860, described it as small and low, in lat.  $24^{\circ} 22' N.$ , long.  $131^{\circ} 15' E.$  (6) More recently (1868) Capt. J. C. DIXON, of the *Joseph Sprott*, places the centre in lat.  $24^{\circ} 30' N.$ , long.  $131^{\circ} 11\frac{1}{2}' E.$ , and he describes the island as " $3\frac{1}{2}$  miles long,

\* "At 9 A.M., when sights were taken for time, the highest point bore N.  $64^{\circ} W.$   $10\frac{1}{2}$  miles; the wind being light, ship only sailed 6 miles N.N.W.  $\frac{1}{2} W.$  till noon, and then the same point bore S.  $88^{\circ} W.$  7 miles. Our lat. at noon was  $24^{\circ} 27' N.$ , and the chronometers gave the point selected in long.  $131^{\circ} 5\frac{1}{2}' E.$ , being  $25\frac{1}{2}'$  east of the position in the Directory."—*Nautical Magazine* for 1868, p. 663.

S.S.W. and N.N.E., generally low, the highest part about 220 feet above the sea-level, covered with very short brushwood, and having deep water all along its western side."

*Position*.—For latitude the mean of 1, 2, 4, 5, and 6, and for longitude, the mean of 1, 2, 3, 4, 5, and 6,—give for the centre of Rasa island, lat.  $24^{\circ} 26' N.$ , long.  $131^{\circ} 9\frac{1}{2}' E.$

**Kendrick island**, discovered by an English shipmaster of that name, was stated to be in lat.  $24^{\circ} 35' N.$ , long  $134^{\circ} E.$ ; from its being described as "low, and 6 miles in length," it has been supposed to be identical with Rasa island, but this is not certain; nothing has been heard of it since the original notice was published. A *small low island* has also been reported, in lat.  $24^{\circ} 30' N.$ , long.  $132^{\circ} 42' E.$ , nearly midway between Rasa and Kendrick islands, but on no reliable authority.

#### MEIACO, LU-CHU, LINSCHOTEN ISLANDS, &c.

These groups form a chain of islands extending in an East and N.E.-ly direction, between the east side of Formosa and the south extremity of Japan. They were known to the Chinese and Japanese, and inhabited, long before Europeans had any commercial relations with the East.

These islands should properly be included under the head of "Sailing Directions for China and Japan," but are incidentally introduced here as rendering the "Directions for the North Pacific Islands" more complete than if they were omitted.

**MEIACO-SIMA or MAJICO-SIMA group**.—This group is the westernmost of the chain, being between Formosa and the Great Lu-chu, and lies between lat.  $24^{\circ}$  and  $25^{\circ} 7' N.$ , and between long.  $122^{\circ} 54'$  and  $125^{\circ} 30' E.$  The language, manners, customs, and appearance of the people are similar to those of the people of the Lu-chu group; and they are governed by officers appointed from Lu-chu, whither they send an annual tribute. Each of the islands is independent of the other.

"The soil is arable, and troops of half wild horses scamper over the grassy plains, while herds of large black oxen browse on the hill sides. The inhabitants plough with a single ox, rudely and superficially, cultivate a few paddy fields, weave a kind of cloth with a frame and shuttle, and manufacture seines and other fishing gear; but generally they are void of energy and enterprise, living in contentment on a group of islands, of the value and facilities of which they are almost entirely ignorant, and of whose position and resources they are unable to take advantage.

"The variety and beauty of the vegetation clothing the sides of the mountains of Pa-tchung-san, and its neighbour Ku-kien-san, is very striking. The light glaucous foliage of a species of *Spondias*, mingled with the leaves of the *Pandanus* and broad fronds of the Palmyra palm, varied with masses of the dark green cypas, and here

and there the feathery sprays of elegant acacias, with large-flowered hibisci, convulvi, climbing-plants and creepers, interspersed with broad patches of Norwegian pine, rising from beds of tall grass and gigantic reeds, formed together a scene of singular botanical interest." (BELCHER, 1844.)

The group consists of two divisions—Pa-tchung-san and Ty-pin-san,—with the outlying islands of Kumi and Chung-chi.

*Caution.*—Vessels should not approach these islands after dark. From the western limit of Chung-chi island to the eastern range of Ty-pin-san breakers, the space is dangerous. Independent of the many reefs which connect the islands, the constant strong winds, with haze and rain during the N.E. Monsoon, render the approach at that season very hazardous except on a clear day. Of the dangers of the north side of the group, it would not be prudent that any vessel should run the risk of being hampered by the shoals, and therefore, when beating up for Chusan, should not come farther eastward than to sight Chung-chi island. The currents, as these islands are approached, press more southerly and easterly, than those that are experienced on the coast of Formosa, and stronger breezes prevail as a vessel advances easterly; indeed it blows incessantly among the Meïaco-sima group.

**KUMI** or **Koumi**, the westernmost island of the group, is about 6 miles long (East and West), and 2 miles wide, and is readily distinguished from a distance by its table base and single pinnacle 750 feet high. It is composed of coralline limestone, and the summits are everywhere capped with trees and brushwood, but, excepting the pine fir, none of the trees attain any size. The island is encircled by a reef, which off the north and N.W. sides stretches to the distance of  $1\frac{1}{2}$  or 2 miles from the shore. There are four villages;—one on the south, one on the west, one inland in a basin-shaped valley, and another on the north; the latter, named Pseu-bang-yah, is the principal port, and is frequented only by small junks, as the entrance is so narrow and shallow that ingress and egress can only be effected at spring tides, and with very smooth water. Temporary anchorage, in fine weather, may be found on a sandy ledge northward of the village.

The inhabitants are very poor, and the soil not very productive. Cattle, horses, and goats are plentiful, but ships could not procure any supplies. BELCHER calls the island, Y-na-ku.

*Position.*—BELCHER (1845) made the north beach in lat.  $24^{\circ} 26' N.$ ,  $122^{\circ} 56' E.$ ; JURIEN DE LAGRAVIÈRE (*Bayonnaise*, 1849) made the centre in lat.  $24^{\circ} 26' N.$ , long.  $123^{\circ} 8' E.$ ; hence, centre, mean of positions, lat.  $24^{\circ} 25\frac{1}{2}' N.$ , long.  $123^{\circ} 1\frac{1}{2}' E.$

*Dangers.*—It is probable, from the following reports, that there are several dangers to the westward of Kumi, but their precise position is unknown:—

1. **Helen Stewart breakers.**—Capt. WHITTINGHAM of the *Helen Stewart*, working up to Chusan outside Formosa, Nov. 17th, 1843, says, "At 4h. 30m. P.M., standing N.N.E. with an easterly wind and heavy northerly swell, Kumi island bearing E.  $\frac{1}{2}$  S. about 3 leagues, we saw heavy breakers ahead and on the lee bow, extending from N.N.E. to N.N.W., distant 4 miles, and bore up to pass to leeward of them. It appeared to be a dangerous shoal, extending E. by N. and W. by S. 3 miles, and bearing N.W. by W. about 3 or  $3\frac{1}{2}$  leagues from Kumi; the sea broke continually on the middle part, but only occasionally on the extremes. The

weather being dark and cloudy, with rain, it was too late to send a boat to sound."\*

The ship *Velox*, in 1860, saw no indication of these breakers.

**2. Bondrouet or Roebur rocks.**—In December, 1864, Capt. BONDROUET of the French ship *Roebur*, reported a group of rocks 65 feet high, perpendicular on all sides, broken in two or three places, but the summits of uniform height. The ledge seemed about 100 yards long. Shortly afterwards he made Kumi and rectified the position of the rocks, which he made in lat.  $24^{\circ} 9' N.$ , long.  $122^{\circ} 23' E.$ \*

**PA-TCHUNG-SAN GROUP.**—This group—the nearest of which is 32 miles eastward of Kumi—consists of ten distinct islands, of which five only are at all mountainous; the remainder are flat, like the *coral islands* of the Pacific, and similarly belted with reefs, such as in this instance connect the ten islands into a distinct group. The two principal islands of the group are Ku-kien-san and Pa-tchung-san, which afford several commodious harbours, and are, *with good charts*, quite safe of approach. Port Haddington, on the west side of Pa-tchung-san, would shelter a large fleet, but it abounds with coral patches, rising suddenly from 10 or 15 fathoms almost to the surface; in clear weather all those having as little as 5 fathoms over them are clearly discernible, and therefore easily avoided. Except on the northern side of Ku-kien-san and at Port Haddington, watering is very difficult, as reefs extend a great distance from the mouths of the streams. Seymour bay, at the S.W. angle of Ku-kien-san, must however be excepted, for there a fine stream enters the sea in deep water, and a vessel might be moored sufficiently close to lead the hoses into her, without the intervention of boats and casks.

**KU-KIEN-SAN ISLAND**, 32 miles eastward of Kumi, is  $15\frac{1}{2}$  miles long (W. by S. and E. by N.), 12 miles wide, and its highest part about 2000 feet above the sea. To the northward of it, at the distance of  $2\frac{1}{2}$  miles, is a small island 40 feet high, named *Isaac*, which is encircled by a reef. No instructions can be given for the various anchorages of Ku-kien-san, but there are two or three small harbours adapted for shelter for small vessels, or even those drawing 18 feet, where a refit might be accomplished in still water in any Monsoon, or where steam-vessels might lie safely for the purpose of obtaining wood; and there are two other open bays, well sheltered in the N.E. Monsoon, admirably adapted for watering; but there is no other inducement to visit this island. All the dangers are well marked by the coral fringe which extends about a cable's length from the outline. **Ports Gage, Herbert, and Cockburn** are on the west side of the island. **Seymour bay** is on the south side, just round the S.W. end. Herbert island on the west side is 700 feet high; Mount Gordon on the S.W. 800 feet; and Adam peak on the south side 1200 feet.

**Chung-chi island**, 8 miles S.W.-ward from Ku-kien-san, is a high uninhabited

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\* This shoal (1) has been placed on the charts in duplicate owing to the newspaper report giving its bearing from Kumi as S.W. by W.—The shoal (2) has also been duplicated, being first reported as from Capt. BONDROUET, and then from the master of the *Roebur*.

mass of rocks. In the opening between this island and Seymour point—the S.W. point of Ku-kien-san—there are several dangerous coral patches. BELCHER calls this Hummock island.

**Hasyokan** or **Sandy island**, off the south side of Ku-kien-san, and 14 miles S. by W. (southerly) from Adam peak, is 3 miles long, East and West, and has a reef off its S.W. end extending about a mile. There are a few trees and huts on it. There is no safe passage between this island and Chung-chi.

**Koubah, Robertson, Baugh, Inglesfield, and Loney islands** are on the reef connecting Ku-kien-san and Pa-tchung-san; Loney island is also connected by numerous reefs and shoals to Hasyokan island.

**PA-TCHUNG-SAN island** is exceedingly irregular in outline, and sends off towards the N.E. to the distance of 11 miles a long, narrow peninsula terminating in point Adam, in about lat.  $24^{\circ} 38' N.$ , long.  $124^{\circ} 20' E.$  Every part of the island is bordered by a coral reef, and, as already observed, it is connected with Ku-kien-san by a plateau of coral, on which are several small islands and islets. A hill on the north side of the island is 1500 feet high, another near the centre of the peninsula 1700 feet, and a third at the extremity near Adam's point 1200 feet. There are two anchorages on this island,—Broughton bay at the south end, and Port Haddington on the west side. On the north shore of Port Haddington is the town of Kichi and residence of the chiefs.

*Directions and caution.\**—Great caution is requisite in approaching the Meïacosima group from the north-east, east, or south, particularly with fresh breezes, and in the absence of the sun, by the aid of which reefs below water can be detected. They are, from their greenish hue, being covered by seaweed, less distinct than at other places, and therefore, where they are not marked on the chart, it must not be presumed that the space is free from danger; the lead will not afford timely warning.

Approaching the group from the south-west, the island of Ku-kien-san, from its great height, will be first distinguished, presenting a round-backed summit closely clad with trees; knolls occur, elevated 2000 feet above the sea, but as they seldom present the same appearance, owing to those nearer the coast eclipsing them, their accurate measurement could not be obtained; Adam peak, which may be noticed on the south-eastern outline, was determined to be 1200 feet. As the island is neared, the high rocky basaltic island of Chung-chi will show out when the western limit of Ku-kien-san bears N.E. by N., and working for this islet no danger can be feared, and should night befall, all the space on the north-west of Ku-kien-san up to the island of Kumi is safe.

The *Samarang* entered the group from the westward, passing within 2 miles of the southern reefs or breakers off Hasyokan or Sandy island, and standing on close hauled to the eastward, intending to make Ykima, and beat up from it to Ty-pin-san. On the morning following, not seeing Ykima (which is supposed not to exist), and

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\* These remarks are by Capt. E. BELCHER, H.M.S. *Samarang*, December, 1844, and from the China Pilot published by the Hydrographic office.

the weather very boisterous, she stood on to the westward to get under the lee of Pa-tchung-san, and endeavour to reach some place of shelter. On nearing the latter island, she ran down the eastern and southern side, reaching the south-western extremity of its reef about 4 P.M.

Here was a barrier of breakers as far as the eye could reach from the mast-head, and apparently connecting Hasyokan island with the group of larger islands. An opening, however, was found into the reef, and after due examination the vessel was shot up into 13 fathoms, into Broughton bay, and warped into a snug position, where she was moored with just sufficient room to swing, the depths up to the coral ledges varying from 13 to 7 fathoms.

**Broughton bay.**—The only directions which will assist the seaman in finding this snug little anchorage (safe only, however, during the N.E. Monsoon) are as follows:—

Approaching from the westward, as Chung-chi is neared, Hasyokan or Sandy island will soon be seen, and avoiding the space included northerly of a line between Chung-chi and it, a vessel may safely stand on, passing within one mile of the southern limit of Hasyokan, and work for the south-west angle of Pa-tchung-san, avoiding the reefs which extend from it in a direct line N.E. and S.W. to Hasyokan. A high rock, named South rock, will point out the outer reefs of Pa-tchung-san. The dangers between it and Pa-tchung-san must be avoided by eye, the shoals being visible in 5 or 6 fathoms, and breaking upon those of 2 and 3 fathoms. The opening of the reef is in the heart of a deep indentation, just northward of the low south-west point of the island, and it has apparently a centre bar. The right-hand opening is the proper one.

From the eastward there are no dangers which are not clearly visible. After making the land, edge along the southern and eastern breakers until the abrupt turn of the breaker line is seen, at which moment the extreme south-west point of the bay will open. The breakers have regular soundings off them, but the course in will probably lead in 7, 8, or 9 fathoms, deepening to 14 or 15 off the inlet. As the breeze generally blows out, it will be advisable to send a boat to find clear ground off the opening, and shoot up and anchor. The vessel may then be warped in. But if merely intending a cursory visit, the outer anchorage appears good.

At Broughton bay, neither wood nor water can conveniently be procured; and the only reason for noticing it, is that a port of refuge with still water, in case of disaster, may be found on this side of the island; when a disabled vessel could not beat round to the more secure harbour of Port Haddington.

**Position.**—The landing-place in Broughton bay is in lat.  $24^{\circ} 21\frac{1}{2}'$  N., long.  $124^{\circ} 14'$  E.

**Port Haddington.**—No safe anchorage is to be met with between Broughton bay and Port Haddington, which is on the west side of Pa-tchung-san; although during the S.W. Monsoon there are several good bays on the northern side of the island, where anchorage might be found, but certainly not adapted for refit.

When rounding the north-eastern extremity of Pa-tchung-san the two low coral islets of Mitsuna and Tarara ought to be avoided at night, but the dangers by day are clearly denoted by breakers. To the northward of these islets the ground is

foul, and the *Samarang* was compelled to tack to the westward in 7 fathoms, at least 10 miles North of them.

Proceeding from Broughton bay to Port Haddington, after rounding the north-east end of the Pa-tchung-san breakers, and running to the westward the length of the island, haul close round the north-west angle, and edge along southerly within about a mile of the breakers. The port will then open out, into which, with the prevailing breeze of the N.E. Monsoon, it will be necessary to beat. Off Hamilton point, the north point of the port, will be seen a remarkable little rocky hummock, upon which was left a large pile of stones. The bottom, for more than a mile off the point, is rocky and dangerous; but as all the dangers of this port are visible from aloft, there is no risk with a proper look-out. The inner parts of the port have numerous shoals, but there is still abundance of excellent anchorage without, and where the vessel will be land-locked. The *Samarang* anchored about a mile or less within Hamilton point, in 10 fathoms, clear bottom.

From the westward Port Haddington may be sought and reached more expeditiously by working up on the N.W. side of Ku-kien-san, rounding Isaac island and running down off the danger line from Melros point round the reef, which extends one mile off Hamilton point, and shoot into 15 fathoms. The chart exhibits some awkward patches, but a vessel which works decently can thread her way between them, if the sun be bright, as all the shoals may easily be traced from aloft.

This is a most convenient port during the N.E. Monsoon; it is land-locked, it is true, but there is a long fetch for the sea with a S.W. gale, and in that season Typhoons are said to be very violent about this region.

*Position.*—Hamilton point, Port Haddington, is in about lat.  $24^{\circ} 25' N.$ , long.  $124^{\circ} 5\frac{1}{2}' E.$

There is a passage from Port Haddington into Broughton bay which was used by H.M. ships *Lily* and *Contest* (1852), but it abounds with coral reefs.

**SUPPLIES.**—A convenient watering-place was established by sinking a cask and suspending the suction hose over it, so as to prevent the sand from being sucked in. The stream from above was regulated by dams to insure not more than a sufficient supply, by which means the water obtained was beautifully clear. Here wood is abundant, and the position is farther preferable by being so far from the villages as to prevent the authorities from feeling alarmed. Sufficient fire-wood was cut at Tamanu beach to fill the ship, and trees were obtained of pine and other woods adapted for plank.

**Tarara and Mitsuna islands and reefs** are situated between Pa-tchung-san and Ty-pin-san,—22 miles N.E.-ward of the former—and are very dangerous.

**TY-PIN-SAN** or **Tai-pin-san**, the easternmost division of the Meïaco-sima group, like the others, consists of several islands, viz., Ty-pin-san, with E-ra-bu (or Yer-ra-bou) on the west, Corumah (or Y-ki-mah) on the north, As-hu-mah (Kurimah of BELCHER) on the S.W., and Hummock island on the N.E. All these are connected together by extensive coral reefs.

The reefs do not project far westward from As-hu-mah, unless in patches unconnected with the main belt. Off E-ra-bu they extend 3 or 4 miles, but close towards its north-western angle, where a deep water channel admits vessels within the belt up

to Hummock island and into the main harbour of Ty-pin-san. The reefs again spit out on the south-west angle of Corumah, and sweep northerly, as far as the eye can reach (from 100 feet elevation), round to east in continuous lines of breakers, edging in towards the south-east extremity of Hummock; it was on this reef that H.M. ship *Providence*, Capt. BROUGHTON, was wrecked in 1797. A high patch of rocks lies on the north-east angle of this outer belt, probably 10 miles from the northern point of Ty-pin-san.

Safe anchorage during the S.W. Monsoon might be found inside the reefs of Hummock island; and also safe in the other Monsoon, but the passage in or out at that season would be attended with risk, as sudden squalls, gales, and numerous patches beset the whole eastern side of Ty-pin-san. The southern coast line, from the south-east breaker patch to the south-west anchorage, does not offer many dangers if a tolerable look-out be observed. The reefs do not extend more than half a cable from the shore, and generally less.

There is no inducement for a vessel to visit Ty-pin-san; neither wood, water, nor any other necessaries could be procured. A few pigs, fowls, and sweet potatoes might be obtained for cabin use, but this would hardly warrant the risk and detention on such a dangerous coast.

FROM PORT HADDINGTON TO TY-PIN-SAN.—After quitting Port Haddington the *Samarang* beat to the northward, and endeavoured to weather the two low coral islets, Mitsuna and Tarara. She had passed the breakers, leaving them about 5 miles under her lee, when finding the depths decrease to 7 fathoms, the vessel was immediately tacked, and stood to the S.W. Capt. BELCHER strongly suspects that extensive banks or ledges of coral connect these islets (northerly) with Ty-pin-san; and a good reason for this offers in the fact of their being included by the natives in the Ty-pin-san group.

Upon nearing the south-west part of Ty-pin-san, and having tacked twice, rather close to two off-lying patches, and obtaining soundings with 15 fathoms, a boat was sent ahead. Upon a given signal, for "danger discovered," the anchor was let go, and the vessel found to be in a secure berth in 12 fathoms, the boat being on the reefs. It is merely an indentation formed by the reefs connecting the western island As-hu-mah with Ty-pin-san, and is very unsafe, a heavy sea tumbling in with a southerly wind. The observatory at the S.W. angle of Ty-pin-san (at the most convenient landing-place within the reefs, and the last rocky point towards the long sandy bay) is in lat.  $24^{\circ} 43' 35''$  N., long.  $125^{\circ} 17' 49''$  E.

Ty-pin-san should not be approached at all on its northern side,—the reefs extending beyond the clear radius of vision from the summit of Corumah; on the south side the reef extends about a mile from the land, and vessels, during northerly breezes, might lie to under its lee until morning;—the drain of current is southerly.

**Ykima**, with an islet to the N.E.-ward of it, in lat.  $24^{\circ} 26'$  N., long.  $125^{\circ} 28'$  E.,—(lat.  $24^{\circ} 23'$  N., long.  $125^{\circ} 13'$  E., by RAPEL,)—or 17 miles southward of Ty-pin-san, was not seen by BELCHER, who sought for it in 1844; nor was it found by the U.S. squadron.

**HOA-PIN-SU, PINNACLE, and TI-A-USU islands.**—"This group forms a triangle, of which the hypotenuse, or distance between Hoa-pin-su and Ti-a-usu extends about 15 miles, and that between Hoa-pin-su and the South Pinnacle about 2 miles. Within this space lie several reefs; and although a safe channel exists between Hoa-pin-su and Pinnacle islands it ought not (by reason of the strength of the tides destroying steerage) to be attempted if it can be avoided. This is also very deceitful, as the slight deviation of course which would change the current from the weather to the lee bow would also most materially change the rate of sailing, particularly under the variables which prevail here, and from the reliance on what would be deemed a commanding breeze, the vessel would be suddenly found unmanageable." (SIR E. BELCHER.)

**Hoa-pin-su.**—"The extreme height of Hoa-pin-su was found to be 1181 feet, the island apparently cut away vertically at this elevation, on the southern side, in a W.N.W. direction,—the remaining portion sloping to the eastward, where the inclination furnished copious rills of excellent water. The composition of the island is trap and other volcanic rocks, which are deeply inclined to the N.E., facilitating the flow of water to the beach on that side. That this supply is not casual, is proved by the existence of fresh-water fish, found in most of the natural cisterns, which are connected almost to the sea, and abounding in weeds which shelter them. There are no traces of inhabitants; indeed, the soil is insufficient for the maintenance of half a dozen individuals." (SIR E. BELCHER.)

**Position.**—BELCHER (1845) made the position of the N. face of Hoa-pin-su in lat.  $25^{\circ} 47' 7''$  N., long.  $123^{\circ} 29' 50''$  E.—JUBIEN DE LAGRAVIERE (*Bayonnaise*, 1849) placed the centre in lat.  $25^{\circ} 46'$  N., long.  $123^{\circ} 35'$  E.;—Mean of positions, centre, lat.  $25^{\circ} 46\frac{1}{2}'$  N., long.  $123^{\circ} 32'$  E.;—the Admiralty chart however places it 5' more westerly.

**Pinnacle** group "is connected by a reef and bank of soundings with Hoa-pin-su, allowing a channel of about 12 fathoms between it and Channel rock. It presents the appearance of an upheaved, and subsequently ruptured, mass of compact grey columnar basalt, rising suddenly into needle-shaped pinnacles, which are apparently ready for disintegration by the first disturbing cause, either gales of wind or earthquake. On the summit of some of the flat rocks, long grass, similar to that usually noticed on rocks frequented by sea birds, was found, but no shrubs or trees. The rocks were everywhere whitened by the dung of marine birds, comprising the Booby, Frigate bird, and various Tern, the noise from which was almost deafening." (SIR E. BELCHER.) The reef on which these rocks are situated stretches 6 miles to the eastward, and 4 miles to the northward of Hoa-pin-su,—according to the chart.

**Ti-a-usu**, about 15 miles N.E.-ward from Hoa-pin-su, "appears to be composed of huge boulders of a greenish porphyritic stone, probably basalt, cemented by coralline and amygdaloidal matter, the upper surface being loose plates of greyish basalt. In addition to the sea birds noticed on Pinnacle island, the gigantic Petrel is found here. The capping of this island, from about 60 feet to its summit, which is about 600 feet above the sea-level, is covered with a loose brushwood, but no trees of any size." (SIR E. BELCHER.)

**Position.**—BELCHER made the lat.  $25^{\circ} 57\frac{1}{2}'$  N., long.  $123^{\circ} 41'$  E.

**RALEIGH rock.**—This rock had been placed on the chart some time, but its existence was considered doubtful until reported by H.M.S. *Raleigh* in 1837. It was visited by Capt. BELCHER in 1845, but owing to the state of the weather he was unable to obtain any observations to determine its position; he says—"I found landing practicable, and remained on the reef upon which it rises as long as any hope remained either of seeing the sun, or of obtaining the bearing of Ti-a-su from it. Raleigh rock rises abruptly from the reef to a height computed at 90 feet, perpendicular on all sides, and covering an area of probably 60 feet in diameter, appearing in the distance as a junk under sail."

Capt. CROWDACE (*King Lear*, 1863) obtained five sets of sights with bearings of the rock from N. 4° E. to S. 79° W., by the west; he describes it as 90 feet high, rising very abruptly, and when bearing west (northerly) another small rock, standing erect like a pillar in ruins, is seen to the northward of it,—an open space between the two.

Capt. TATCHELL (*Speedy*, 1863) claims good observations, and says, "at noon it bore W.N.W. distant 3 leagues; it can be seen 5 leagues in clear weather; bearing West 4 leagues, it has the appearance of two rocks: I could not see any broken water, nor any sign of soundings; nor any place for landing,—it being straight up and down on the N.E. end, and bold-to."

Its height is probably more than 90 feet; for Lieut BROOKE, U.S. Navy, estimated it to be about 230 feet high, and he saw breakers extending from it  $2\frac{1}{2}$  miles to the S.W.; and more recently (1866) Commander BULLOCK made the height 270 feet. It was seen by the U.S. ship *Powhatan* (1854), but no description was given.

**Position.**—Owing to Raleigh rock being situated in the Kuro-siwo or Japan current, several very widely differing positions have been assigned to it. RAPER placed it in lat. 25° 57' N., long. 124° 34' E.;—JUBIEN DE LAGRAVIERE (*Bayonnaise*, 1849), lat. 25° 50' N., long. 124° 32' E.;—Lieut. BROOKE (U.S.), lat. 25° 57' N., long. 124° 28' E.;—Capt. POLACK (1861), lat. 25° 57' N., long. 124° 28' E.;—Capt. POLACK (1863), lat. 25° 57' N., long. 124° 31' E.;—Capt. CROWDACE, lat. 25° 51' N., long. 124° 42' E.;—Capt. TATCHELL (1863), lat. 25° 54' N., long. 124° 45' E.;—Capt. TATCHELL (1864), lat. 25° 54' N., long. 124° 44' E.; U.S. *Powhatan*, lat. 25° 53' N., long. 124° 48' E.;—Commander BULLOCK (1866), lat. 25° 55' N., long. 124° 34' E.;—the mean of all these positions will place Raleigh rock in lat. 25° 55' N., long. 124° 36½' E.; and it may be considered correct within 1' of lat. and long. If the position of the next rock (Recruit) is included, it will give lat. 25° 56' N., long. 124° 37' E.

**Recruit rock.**—The ship *Recruit* when navigating to the northward of the Meisima group, saw an island the position of which by observation was found to be in lat. 26° 8' N., long. 124° 44' E.

Capt. LYALL states,—“On the evening of 11th of March, 1861, passed the islands of Hoa-pin-su and Ti-a-su, standing to the eastward under a press of sail, going 5 and 7 knots an hour all night. At 6 P.M., Ti-a-su bore S.S.E. 10 miles: from thence sailed E.  $\frac{1}{2}$  N. 32 miles, and E. by N.  $\frac{1}{4}$  N. 38 miles, until 6 A.M. on the 12th, when an island bore S.S.W. distant 10 miles. From all appearance the island seemed to be about a mile in extent and 600 feet high, the same size and height as Ti-a-su.”

Capt. CROWDACE in 1863, passed within 15 miles of this assigned position, and saw nothing of the island; he observes, "I should certainly have seen an object 600 feet high, as the weather was very fine and the atmosphere very clear, and I had a good look-out."

No other navigator has reported it, and it may be presumed that Raleigh rock was seen. If, as is probable, Raleigh rock is upwards of 200 feet high, and it has been estimated at 90 feet, another might well judge it to be 600 feet, for comparatively few *estimate* height and distance correctly; still, caution requires that vessels passing by this route should endeavour to verify the fact of the existence of Recruit island.

**PINNACLE, CRAIG, and AGINCOURT islands** are well known but have never been described; they lie to the N.E.-ward of the north point of Formosa, and are often sighted by passing vessels; but they should not be approached too near, as there are said to be reefs among them not laid down on the charts, and the currents are strong and variable in the vicinity.

*Positions* :—Pinnacle island is N.E. by E.  $\frac{1}{2}$  E. 20 miles from Foki point, and North  $18\frac{1}{2}$  miles from Petou point, in lat.  $25^{\circ} 27' N.$ , long.  $121^{\circ} 58' E.$ ;—Craig island is E.N.E.  $\frac{1}{2}$  E. 8 miles from Pinnacle island, in lat.  $25^{\circ} 29' N.$ , long.  $122^{\circ} 9' E.$ ;—and Agincourt island is North 8 miles from Craig island, and N.E. by N. 13 miles from Pinnacle island, in lat.  $25^{\circ} 38' N.$ , long.  $122^{\circ} 8' E.$

The **LU-CHU or LIU-KU ARCHIPELAGO** lies N.E. by E. from the Meiāco-sima group, the nearest distance between the islands of the two groups being 117 miles. It consists of two large islands—Okinawa-sima at the S.W., and Oho-sima at the N.E. extremity—between which, and in their vicinity, are numerous smaller islands, many of them grouped together in clusters, the whole (with some out-lying rocks) being situated between lat.  $26^{\circ}$  and  $28^{\circ} 46' N.$ , and between long.  $126^{\circ} 42'$  and  $130^{\circ} 17' E.$

The archipelago consists of the following islands and groups of islands, commencing from the southward,\* viz.—Okinawa-sima or Great Lu-chu island, Iye or Ee island, the Amakirima group, Tunashi, Agunyah, Komisang, Tu-sima, the Montgomery group, Jori or Yori-sima, Jerabu or Yerabu-sima, Tok-sima or Kakiroma,

\* The principal sources of information for these islands are Capt. BASIL HALL (1816), Capt. F. W. BEECHER (H.M.S. *Blossom* in 1827), Capt. Sir EDWARD BELCHER (H.M.S. *Samarang* in 1845), the U.S. Naval Expedition to Japan under Commodore PERRY in 1852-54, the U.S. North Pacific Surveying Expedition under Lieut. J. RODGERS with additions by Lieut. J. M. BROOKE, various French authorities, &c. &c.

All the positions have been rectified to the meridian of Abbey point, Nafa-kiang, in long.  $127^{\circ} 40' E.$  (see p. 134); hence, from  $2'$  to  $3' E.$  of the positions assigned by the U.S. North Pacific Surveying Squadron, and the same amount W. of the positions assigned by COLLINGS and others.

Iwo-sima, the Oho or Ou-sima group, Kikai-sima, and other small islets and reefs in the vicinity of the larger islands.

**OKINAWA-SIMA**, or **GREAT LU-CHU island**, the principal member of the archipelago, lies between lat.  $26^{\circ} 4'$  and  $26^{\circ} 51' N.$ , and between long.  $127^{\circ} 39'$  and  $128^{\circ} 22' E.$  It is about 57 miles long in a general N.E. and S.W. direction, and preserves a tolerably uniform breadth of about 10 to 12 miles. The north end is high and bold, with wood on the top of the hills; the N.E. coast is also abrupt, but quite barren; and the N.W. side is generally rugged and bare. The S.E. side is low, with very little appearance of cultivation. The south, S.W., and western faces, particularly the two former, are of moderate height, and present a scene of great fertility, and high cultivation; and it is to this end that the mass of population has resorted. There are two deep indentures, one on each side of the island; that on the west (Deep bay) is deep and appears to have no coral in it; while the eastern bight (Barrow bay) is shallow, and is not only skirted by a broad fringe of coral, but has reefs in the centre; and these last are very dangerous, for they give no warning either by breakers or discoloration of the water, or by soundings; and this remark will apply generally to all the reefs round the island, rendering the navigation, particularly at night, very dangerous. (BASIL HALL.)

There are two places where ships can ride in safety,—Nifa-kiang roads on the S.W., and Port Melville or Oonting on the N.W. side of the island: these will be described subsequently, together with others of minor importance.

**CLIMATE AND WINDS.**—The climate is one of the finest in the world; fresh breezes blow all the year round, and the heat and cold are never excessive. The winds are the regular N.E. and S.W. monsoons. During the visit of the American squadron in 1854, the S.W. monsoon was regular in May and June, veering to S. and S.E. in July; in August the wind was variable,—sometimes light, sometimes blowing in strong squalls, and bringing rain. The N.E. monsoon commenced in the early part of September and was still blowing when the squadron sailed in February; during the winter this monsoon was occasionally interrupted by gales from the North and West,—generally accompanied with heavy rain. The islands are in the heart of the Kuro-siwo.

**PRODUCTIONS.**—The soil is generally a mixture of decomposed volcanic rock and alluvium, hence it is exceedingly fertile, and capable of producing all the fruits and vegetables of both the tropical and temperate zones. Rice and sugar are cultivated with great care; vegetables and live stock are very abundant; eight kinds of potatoes and yams are grown; but fruit is comparatively scarce,—the natives not using much of it. The vine, orange, citron, &c., grow without culture. The cattle, goats, and pigs are small, but the poultry are large and excellent. Sulphur and salt are among the productions of the island, and (it is said) copper and tin mines are worked. The people manufacture cloths, paper, lacquered ware, tobacco pipes, &c. In the woods there are deer, hares, and other game. Horses are numerous, and one breed is much esteemed. Pine and hard yellowwood, used in building, abound in the numerous forests.

**PEOPLE AND TRADE.**—The people are friendly and hospitable, but cautious. Their commerce is not extensive, and it is chiefly confined to the neighbouring islands,—occasionally with Japan, and rarely with China. The islands are nominally

appendages to Japan, and the people used and may now occasionally send a small tribute to China, but they are essentially independent as regards internal administration.

**Sheudi**, the capital and residence of the chief or king, and **Wafa-kiang**, the principal port, each contain from 12,000 to 13,000 inhabitants; and villages of from 1000 to 1500 persons are numerous.

*Positions*.—Abbey point, near Nafa-kiang, is in lat.  $26^{\circ} 12' 25''$  N., long. (the mean of seven meridian distances from Hong Kong, 110 chronometers)  $127^{\circ} 40' 3''$  E.

Cape Heto or Hope point (the N. point of Okinawa-sima) is in lat.  $26^{\circ} 51'$  N., long.  $128^{\circ} 17'$  E.

Cape Yakimu (the S. point of Okinawa-sima) is in lat  $26^{\circ} 4\frac{1}{2}'$  N., long.  $127^{\circ} 41'$  E.

Gama Satchi (or Cape Broughton), on the west side of Okinawa-sima, and off which there is a small reef, is in lat.  $26^{\circ} 25\frac{1}{2}'$  N., long.  $127^{\circ} 44'$  E.

**REEF islands**—the Tze or Kei of Siebold—lie 4 miles W.N.W. from the entrance channels to Nafa-kiang. They are four in number—the easternmost two standing close together, on the same reef; they are low, sandy, slightly covered with vegetation, and surrounded by coral reefs.

**Hall reef** or Sandy island is a considerable circular patch, part of which is just above water, and at low tides shows several rocks. Its centre lies W. by N.  $\frac{1}{2}$  N., 7 miles from the S.W. point of Okinawa island, in lat.  $26^{\circ} 6'$  N.—**BASIL HALL** says the sea broke high upon it, but it is very probable that when the water is smooth it will give no warning.

*Heber shoal*, reported by Capt. PATTERSON of the *Heber*, is said to lie W.S.W. 6 or 8 miles from the S.W. point of Lu-chu (Okinawa); it was described as one mile in extent, with a rock 5 feet above water in its centre. The bearing given does not coincide with Hall reef, but in every other particular there is a close agreement.

**IYE or EE-SIMA**, an island two miles from Cape Niofa, the N.W. point of Okinawa-sima, is 4 miles long east and west: it is low and flat with the exception of a conical peak (near its eastern end) rising to an altitude of 575 feet, and which, when



*Iye or Ee-Sima—The Sugar Loaf E.N.E. dist. 5 miles.*

viewed from different quarters, varies very little in aspect; it can be seen about 25 miles. Port Oonting lies 12 miles eastward of the island; it is therefore a good mark to make for.

*Position* of the peak, lat.  $26^{\circ} 43'$  N., long.  $127^{\circ} 49\frac{1}{2}'$  E.

**MONTGOMERY group**.—This group consists of two large islands, with several islets and shoals near them. It lies N.W.-ward from Cape Heto (the N. point of Okinawa), and N.N.E.-ward from the peak of Iye island,—the channel in the former case being 15 to 16 miles wide, and in the latter 11 miles; and there is apparently no danger when mid-channel is kept, but the group has not been surveyed.

**Jebeja-sima**, the largest island of the group, is 7 miles long (N.E. by N. and S.W. by S.); off its southern end a reef extends  $2\frac{1}{2}$  miles to the S.W.-ward, which has on its centre **Jabo islet**,  $1\frac{1}{2}$  miles long; still further to the S.W.-ward, at the distance of a mile or  $1\frac{1}{2}$  miles is a *rock awash*. The highest peak of Jebeja, 963 feet above the sea, is in about lat.  $27^{\circ} 1' N.$ , long.  $127^{\circ} 58' E.$

S.E. by E.  $1\frac{1}{2}$  miles from Jabo islet, is **Kusikawa** or the Low group, consisting of one islet and several rocks. **Iena-sima**—Ear or Image island—is more to the southward, and its highest point (near the N.W. side) is about 400 feet above the sea; its S.E. extreme, a conspicuous and prominent point, attains an elevation of 309 feet; there is a small detached rock about a mile East of the island.

Southward of Iena-sima is **Janagi islet**, 50 feet high, off the N.W. side of which is a reef with several rocks on it; the centre of this islet is in about lat.  $26^{\circ} 53\frac{1}{2}' N.$ , long.  $127^{\circ} 56\frac{1}{2}' E.$

The **AMAKIRIMA group**—(Kera-sima of SIEBOLD)—lies west from Nafakiang, between lat.  $26^{\circ} 7'$  and  $26^{\circ} 16' N.$ , and between long.  $127^{\circ} 15'$  and  $127^{\circ} 29' E.$  It consists of the Maikirima islands (highest point 540 feet), Koru-sima or Saddle island (459 feet), Toka-shi (553 feet), Assa island (540 feet), Amuru island, Stevens island (641 feet), Kupa-sima (916 feet), and Yakang island (756 feet), with many islets, rocks, and shoals in their vicinity, by avoiding which there appears to be a tolerable ship passage between the various islands, and an anchorage to the S.E.-ward of Assa island, in from 9 to 16 fathoms.

The **Maikirima islands**, the easternmost of the group, consist of one island with two small islets in line (to the northward) on a reef projecting from the north end of the island; the northernmost islet (**Cone islet**) is in lat.  $26^{\circ} 14' N.$ , long.  $127^{\circ} 28\frac{1}{2}' E.$ , and must not be approached too close, as the reef extends around it some distance. The island has a conspicuous *detached rock* off its S.W. end.

**Koru-sima** or **Saddle island**, the northernmost of the group, is in lat.  $26^{\circ} 15' N.$ , long.  $127^{\circ} 25\frac{1}{2}' E.$  (the peak), and has a reef extending  $\frac{1}{2}$  a mile from its south and S.W. end. A few islets or rather high rocks mark its N.W. end.

The two westernmost islands of the Amakirima group are Yakang and Kupa-sima.

**Yakang** (peak) is in lat.  $26^{\circ} 13' N.$ , long.  $127^{\circ} 16' E.$ ;—the reef bordering it stretches furthest seaward to the northward, and is there marked by a detached rock. From the peak, which is 756 feet high, the high rock S.E. of Komisang island bears N.  $82\frac{1}{2}^{\circ} W.$ , distant  $23\frac{1}{2}$  miles; highest peak of Komisang, N.  $69\frac{1}{2}^{\circ} W.$ , distant  $27\frac{1}{2}$  miles; N.E. end of Komisang reef, N.  $63\frac{1}{2}^{\circ} W.$ , distant 19 miles; Tu-sima, N.  $44\frac{1}{2}^{\circ} W.$ , distant 32 miles; Flat island or Aghesinak, N.  $37\frac{1}{2}^{\circ} W.$ , distant  $12\frac{1}{2}$  miles; central peak of Tunashi, N.  $32^{\circ} W.$ , distant 10 miles; S.W. bluff of Agunyah, N.  $5\frac{1}{2}^{\circ} W.$ , distant  $21\frac{1}{2}$  miles; and the Sugar-loaf peak on Iye or Ee island, N.  $45\frac{1}{2}^{\circ} E.$ , distant  $42\frac{1}{2}$  miles.

**Kupa-sima** or **High island** is in lat.  $26^{\circ} 10' N.$ , long.  $127^{\circ} 15\frac{1}{2}' E.$ ; a reef projects off its east (northerly) side, but on it are several rocks,—the outermost named **Sail rock**.

No written description would convey an accurate idea of the disposition of the other islands of the Amakirima group, and of the various channels; these, however,

are well delineated on the chart. **Whale reef**, with two rocks on it, is in lat.  $26^{\circ} 7' N.$ , long.  $127^{\circ} 18' E.$  A *bank of soundings* extends a considerable distance southward of the Amakirima group of islands. In July, 1853, Capt. CHEYNE fell in with a fishing boat at anchor, and sounded in 62 fathoms, coral and sand, the western island bearing N.  $\frac{1}{2}$  W. distant 18 miles.

**TUNASHI** island (Kurama of French charts), the central peak 603 feet high, and the northern one 492 feet, has a reef extending some distance from its north and N.W. sides;—the north peak is in lat.  $26^{\circ} 22\frac{1}{2}' N.$ , long.  $127^{\circ} 10' E.$  The channel between it and Yakang island is apparently safe, and about 9 miles wide. About  $2\frac{1}{2}$  miles westward of the north peak of Tunashi is **Aghesinak** or Flat island, in lat.  $26^{\circ} 23' N.$ , long.  $127^{\circ} 7\frac{1}{2}' E.$ ; it is a mere rock surrounded by a reef.

**AGUNYEH** or **Agenbu**, 3 miles long, S.W. by W. and N.E. by E., is a wedge-shaped island 12 miles northward of Tunashi: it terminates in a point to the S.W., near which is a peak 300 feet high, in lat.  $26^{\circ} 35' N.$ , long.  $127^{\circ} 14' E.$ ; the channel between it and Tunashi is safe.

**KOMISANG**, or **Kume-sima** of French charts, is in shape very irregular, about 6 miles long, and the same in width; the north peak is 1108 feet high, and the southern one 1028 feet; a very dangerous reef (**Elizabeth reef**) extends 6 miles eastward of it, and its S.W. side is fringed with reefs and rocks. Its northernmost extremity is in lat.  $26^{\circ} 22\frac{1}{2}' N.$ , long.  $126^{\circ} 47\frac{1}{2}' E.$ ; the west extreme in lat.  $26^{\circ} 22' N.$ , long.  $126^{\circ} 44' E.$ ; the easternmost edge of Elizabeth reef in lat.  $26^{\circ} 21' N.$ , long.  $126^{\circ} 58' E.$ ; and High rock, off the south extreme, in lat.  $26^{\circ} 16' N.$ , long.  $126^{\circ} 50\frac{1}{2}' E.$

**TU-SIMA**, in lat.  $26^{\circ} 35\frac{1}{2}' N.$ , long.  $126^{\circ} 51' E.$ , lies N.  $15^{\circ} E.$ , distant  $13\frac{1}{2}$  miles from the northernmost peak of Komisang, and N.  $86^{\circ} W.$  from the centre of Agun-ye; each channel is apparently safe. It is a rocky islet much broken, about 70 feet high,  $\frac{1}{4}$  of a mile in extent, with a reef projecting  $1\frac{1}{2}$  miles towards the northward, and one-fourth that distance in other directions.

**Tb-sona** and **Tomu-sima**, 12 miles N. by E.  $\frac{1}{2}$  E. from Agun-ye island, and **Kuri-sima** 25 miles N.N.E.  $\frac{1}{2}$  E. from the same island, most probably have no existence, being perhaps the representatives of some of the islands just described.

**WAPA-KIANG**, on the S.W. side of Okinawa-sima or Great Lu-chu island, is its principal sea-port, and perhaps the only one possessing the privileges of a port of entry. The *inner* or Junk harbour carries a depth of 2 or 3 fathoms, and though small, is sufficiently large to accommodate with ease the fifteen or twenty moderate-sized junks which are usually found moored in it. These are mostly Japanese with a few Chinese and some small coasting craft, which seem to carry on a sluggish trade with the neighbouring islands. The *outer harbour*, or **Wapa-kiang road**, is protected to the eastward and southward by the main land, whilst in other directions it is surrounded by merely a chain of coral reefs, which answer as a tolerable break-water against a swell from the northward or westward, but afford, of course, no

shelter from the wind. The holding ground is so good, however, that a well-found vessel could here ride out almost any gale in safety.

**Abbey point**, at the south extremity of the port of Nafa-kiang, may be known by its ragged outline, and by a small wooded eminence, called Wood hill, about  $1\frac{1}{2}$  miles south of it. The main land here falls back and forms a bay which is sheltered by coral reefs extending northward from Abbey point; they are, however, disconnected, and between them and the point there is a channel sufficiently deep for the largest ship.

Nearly in the centre of this channel, outside withal, there is a coral bank named Blossom reef, with a good passage on either side of it. The South channel, between Blossom reef and Abbey point, should be adopted with southerly winds and flood tides,—and the Oar channel, between Blossom and Oar reefs, with the reverse. A reef extends from Abbey point to the south-west, and also to the northward. When off Abbey point, Kumi or Tumai head, a rocky headland, will be seen about  $1\frac{1}{2}$  miles north of the town; and upon the ridge of high land beyond it are three hummocks to the left of a cluster of trees. In the distance, a little to the left of these, is Mount Onnodake, in lat.  $26^{\circ} 27' N$ . A remarkable rock, which from its form has been named Capstan head, will next appear; and then to the northward of the town a rocky head, with a house upon its summit, called False Capstan head. At the back of Capstan head is Shendi hill, upon which the upper town, the capital of Okinawa or the Great Lu-chu, is built.

**WATER**.—Abundance of water can always be obtained at the fountains in Junk river, where there is excellent landing for boats. There is a good spring near the tombs at Kumi bluff; but unless the water is quite smooth the landing is impracticable, and under any circumstances it is inconvenient from the want of sufficient depth, except at high tide.

**BUOYS**.—A *black* spar-buoy is moored on Blossom reef half-way between its eastern and western extreme; a *red* spar-buoy on the point of reef W.N.W. of Abbey point; and a *white* spar-buoy on the south-east extreme of Oar reef. Flags of corresponding colours are attached to all these buoys, and they afford good guides for the South and Oar channels. There are two large stakes on the reefs eastward and westward of the North channel, planted there by the natives, this being the channel mostly used by junks trading to the northward.

**TIDES**.—It is high water, full and change, in Nafa-kiang road, at 6 h. 30 m., and the rise is from 5 to  $7\frac{1}{2}$  feet; but this was very irregular during the *Blossom's* stay at this anchorage. The flood-tide sets to the northward over Blossom rock, and the ebb to the southward.

**DIRECTIONS**.—Bound from Hong Kong to the Lu-chu islands during the S.W. monsoon vessels should pass through the Formosa channel, giving Pinnacle, Craig, and Agincourt islands, off the north end of Formosa, a safe berth. Thence shape a course to pass northward of Hoa-pin-su, Ti-a-usu, and Raleigh rock (see page 130 to 131), after which haul to the eastward to sight Komisang, and pass either northward

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\* The spar-buoys though securely moored at the time they were placed in position may be displaced or entirely removed by the heave of the sea, and should, therefore, not be implicitly relied on.

or southward of it and of Tunashi, and the small islet near the latter, but *not* between them, as reefs are said to have been seen there. If to the northward give a good berth to Tu-sima. Pass southward of Agunyah, which will be readily recognised by its bold south point and wedge-shaped appearance. The Amakirima group will be seen to the S.S.E., Lu-chu visible on the eastern horizon, and in a short time the Reef islets will heave in sight to the southward and eastward.

*During the N.E. monsoon*, round the south end of Formosa, and with the strong current (the Kuro-siwo) setting to the northward, beat to the northward and eastward along its eastern shore. Pass between Hoa-pin-su and the Meiaco-sima group, and either northward or southward of Komisang; if to the southward, a vessel may hug the northern shores of the Amakirima islands, as it is believed there are no hidden dangers near them.

During the Typhoon season, however, it is advisable to pass southward of the Meiaco-sima group, in order to have plenty of sea room in the event of encountering one of these storms. The passage southward of the Amakirima islands is clear with the exception of the Heber reef and Sandy island or Hall reef, *see* p. 134.

Vessels bound into the road from the southward may pass close round Cape Yakimu, the south extreme of Okinawa, and sail along the western coast at the distance of 3 or 3½ miles, leaving Heber reef and Sandy island to the westward.

**Channels leading to Wafa-kiang.**—There are three passages leading into Nafa-kiang road, named respectively the South, the Oar, and the North channel. These are described in succession. When beating into this harbour, a stranger should have a careful person at the mast-head in order to avoid running upon the reefs.

**To Wafa-kiang through South Channel.**—To sail by the South channel, between Blossom and Abbey reefs, having well opened Capstan head, haul towards Abbey reef, and bring the right-hand hummock about half a point eastward of Kumi head; this mark will lead through the South channel, in about 7 fathoms, over the tail of Blossom reef. A vessel may now round Abbey reef tolerably close, and steer for the anchorage in 7 fathoms, about half a mile N.N.W. of False Capstan head. Should the wind veer to the eastward in the South channel, with the above mark on, do not stand to the northward, unless the outer cluster of trees near the extremity of Wood hill is in line with, or open westward of Table hill, a square rocky headland to the southward of it. This mark clears also the tongue of Oar reef.

**Caution.**—Care must be taken to avoid the Ingersoll patches, on which there is only a fathom water; they were reported in 1837, and bear from Capstan head W. ¼ S., and from South fort N. by W. ¼ W. The French survey of 1846 by the officers of *La Sabine* does not

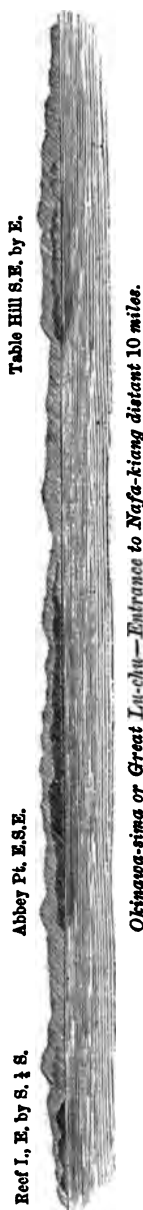


Table Hill S.E. by E.

Abbey Pt. E.S.E.

Reef I., E. by S. ¼ S.

Okinawa-sima or Great Lu-chu—Entrance to Nafa-kiang distant 10 miles.

show these rocks, but three patches having over them respectively 2, 4, and  $4\frac{1}{2}$  fathoms. From the 2-fathom patch Abbey point bears S. by W.  $\frac{3}{4}$  W., and False Capstan head E. by S.  $\frac{1}{4}$  S.; from the 4-fathom patch Capstan head bears S.E. by E.  $\frac{1}{4}$  E., and Abbey point S.W.  $\frac{3}{4}$  W.; and from the  $4\frac{1}{2}$ -fathom patch Abbey point bears S.S.W.  $\frac{1}{4}$  W., and False Capstan head S.E. by E.  $\frac{3}{4}$  E.

The best ANCHORAGE is in Barnpool, at the north-east part of the road, in 7 fathoms, where a vessel may ride with great security. The outer anchorage would be dangerous with strong westerly gales. H.M.S. *Blossom* anchored there in 14 fathoms, muddy bottom, Abbey bluff bearing S.W.  $\frac{1}{4}$  S., and Capstan head E. by S.  $\frac{1}{4}$  S.

The entrance to Barnpool is between Barn head and the reef off Capstan head. In entering, do not approach Barn head nearer than to bring the north edge of Hole rock on with the before-mentioned flat clump of trees on the hill south of Sheudi, until the point of the burying ground (Cemetery point) is seen just clear of False Capstan head. Anchorage may be taken in any part of Barnpool. (BEECHY.)

The following *directions* for the South channel, by Lieut. SILAS BENT of the U.S. Expedition to Japan, accompany a plan of Nafa-kiang road surveyed by that officer in 1853: on the plan are marked two patches of only  $2\frac{1}{2}$  and  $1\frac{1}{2}$  fathoms water; the former (named Lexington reef) lying W.  $\frac{1}{2}$  S.  $1\frac{1}{4}$  miles from Abbey point; and the latter of  $1\frac{1}{2}$  fathoms, W.S.W.  $1\frac{1}{4}$  miles from the point:—

.The clearest approach to Nafa-kiang road from the westward is by passing northward of the Amakirima islands and sighting Agunyah island, which will be recognised by its wedge-shaped appearance; from thence steer a S.E. course for the road, passing on either side of the Reef islands; being careful, however, not to approach them too near on the western and southern sides, as the reefs below water in these directions are said to be more extensive than is shown on the chart.

After clearing the Reef islands, steer for Wood hill on a S.S.E. bearing until getting upon the line of bearing for the South channel. This will lead well clear of Blossom reef, yet not so far off but that the white tomb and clump of trees or bushes southward of Kumi head can be easily distinguished. An E. by N.  $\frac{1}{4}$  N. course now until Abbey point is in one with outer trees will clear S.W. rock, when haul up for Kumi head, and select a berth about half a mile northward and westward of False Capstan head.

This channel, being quite straight, is more desirable for a stranger entering the harbour than the Oar channel, which, though wider, has the disadvantage of its being necessary for a vessel to alter course some four or five points, just when she is in the midst of reefs which are nearly all covered.

The U.S. North Pacific Surveying Expedition give the following *directions* for

Saki Fidsja.

Range Hill  
in range with gap.

Capstan Head.



Okinawa-sima or Great Lu-chu—Entrance to Nafa-kiang.

South Channel. Bring Range hill to bear E. by N.  $\frac{1}{4}$  N. (see above) upon a small

gap in the mountains, about 4 miles inland, and steer upon this range. When Abbey point bears S. by W.  $\frac{1}{4}$  W. steer E.N.E.; when False Capstan head bears S.S.E. anchor.

False Capstan Head S.S.E.



*Okinawa-sima or Great Lu-chu—Entrance to Nafa-kiang.*

**To Nafa-kiang through Oar Channel.**—If the wind be to the north-eastward it will be advisable to beat through the Oar channel, in preference to the South channel. To do this, bring False Capstan head in line with a flat cluster of trees on the ridge to the right of the first gap south of Sheudi. This will clear the north tongue of Blossom reef; but unless Table hill be opened eastward of Wood hill, do not stand to the southward, but tack directly the water shoals to less than 12 fathoms, and endeavour to enter with the marks on. Having passed north-east of Blossom reef, which will be known by Wood hill being seen to the right of Table hill, stand towards Abbey point as close as convenient, and on nearing Oar reef take care of a tongue which extends to the eastward of it and of the S.W. rock, and be careful to tack immediately the outer trees of Wood point open with Abbey point. In entering at either of the western channels, remember that the flood sets northward, over Blossom reef, and the ebb southward. (BEECHER.)

A good mark to run through this channel is to bring the centre of the island in Junk harbour (known by the deep verdure of its vegetation) to fill the gap between the forts at the entrance of that harbour, and steer a S.E.  $\frac{1}{4}$  E. course, until Capstan head bears East, when haul up E.N.E., and anchor as before directed. (LIEUT. S. BENT, U.S.N., 1853.)

Or, keep about  $2\frac{1}{4}$  miles from the land, in 30 fathoms water, until the round green island in Junk river bears S.E., when it will be open midway between the forts, one of which is placed on each side of the mouth of this river. Now steer S.E.

False Capstan Head.

N. Fort, S. Fort,  
bearing S.E.



*Okinawa-sima or Great Lu-chu—Entrance to Nafa-kiang.*

for the south fort, or steer S.E. for the island, keeping it midway between the forts until Abbey point bears S. by W.  $\frac{1}{4}$  W. (or until it is in range with Wood hill), when

steer E.N.E.; when False Capstan head bears S.S.E. anchor, in about 10 fathoms water, muddy bottom. (U.S. Pacific Surveying Squadron, 1855.)

**To Waka-kiang through North Channel.**—This channel is much contracted by a range of detached rocks extending from the reef on the west side, and should not under ordinary circumstances be attempted by a stranger, as at high water the reefs are almost entirely covered, and it is difficult to judge of the vessel's exact position unless familiar with the various localities and landmarks. To enter by this channel, bring a remarkable notch in the southern range of hills in line with a small hillock just eastward of False Capstan head, and stand in with this mark bearing S. by E.  $\frac{1}{2}$  E. until Kumi head bears E.  $\frac{1}{2}$  N., when open it a little to the southward, so as to give the reef to the eastward a berth, and select an anchorage. (LIEUT. S. BENT, U.S.N., 1853.)\*

**DEEP bay**—the observatory spot at the head of which is in lat.  $26^{\circ} 35' 35''$  N., long.  $127^{\circ} 59' 42''$  E.—is formed on the western side of Okinawa-sima or Great Lu-chu, and although open to the west and S.W. affords good anchorage off the town of Naguh, about half a mile from its head; for winds from these quarters rarely blow home, and if they do they never raise a sea, as the latter is broken by the long stretch of the coast from Gama Satchi and by the great depth of the bay.

The country around the head of this bay is fertile and populous, Motubu and Naguh being the largest towns. At the town of Oon-sah there is a good ship and timber yard where junks are built; here also the natives were found more affable and sociable than on any other part of the coast. This part of Okinawa-sima (extending to beyond Nacosi on the opposite coast) appears to be in a high state of cultivation; rice and sweet potatoes are the principal productions; but on the northern side of the peninsula, north of Deep bay, extensive fields of wheat were seen extending uninterruptedly for several miles. Cotton was observed also in many places, but the growth was small and the yield poor. Peas, beans, radishes, turnips, and sugarcane were growing in considerable quantities, also mustard and ginger. On the Natchijen mountains, 1488 feet high, cinnamon was growing wild, and there was also a fine growth of timber, which furnishes most of the spars for the native junks; Nakazuni cove, on the north side of the peninsula, being the principal depôt, whence they are transported to the other parts of the island. (LIEUT. WHITING, U.S.N., 1854.)

**SUCO or SETHI ISLAND**, lying about a  $\frac{1}{2}$  of a mile from the N.W. coast of Okinawa-sima or the Great Lu-chu, to the northward of Deep bay, has excellent anchorage between its eastern side and the coast, protected from all winds; and wood, water, and fresh provisions can be easily procured. There is free egress to the northward and southward, and although the anchorage appears open to the southward, yet it is well sheltered in that direction by the reef extending S.S.E. nearly

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\* Being to the N.W.-ward of the entrance by North Channel, and intending to use it, Kumi head bearing S.E.  $\frac{1}{2}$  E. leads north of all the reefs, until the notch comes in range as above. BEECHY (1827) says—"The northern channel is very dangerous, and I shall not tempt any person to sail through it, by giving directions for it."

half a mile from the south end of Suco, and by the southern shore of Deep bay. (LIEUT. WHITING, U.S.N.)

**Tubooteh bay** just to the north of Suco island is 2 miles long by  $\frac{1}{2}$  of a mile wide; though open to the westward it is partially protected in that direction by a line of reefs, on which the sea breaks heavily, but the continuity of which is here and there broken by a narrow but tolerably deep channel. The north side of this bay is full of banks, but towards the centre there are safe spots with from  $3\frac{1}{2}$  to 11 fathoms water, bottom of mud. The best channel to it is the southernmost, which is about 2 cables wide, and with about 7 fathoms water in it.

**PORT OONTING** or **Melville**, is on the N.W. part of Okinawa-sima or Great Lu-chu, and its entrance is between the eastern side of Kui or Herbert island and the western side of the reef fronting the peninsula, and which projects 5 or 6 miles to the westward, having a small islet near its extremity. Iye-sima or Sugar-loaf island (p. 134), lying about 12 miles westward of the entrance, is a good guide for it.

**WATER.**—Good water can be obtained at the village of Oonting.

**TIDES.**—It is high water at Port Oonting, full and change, at 6h. 35m., and the rise is about 8 feet.

**DIRECTIONS.**—When bound to this port from the westward, passing to the northward of Iye-sima, an E.S.E. course will lead to the entrance. It will be advisable to heave-to here, or anchor in 20 or 25 fathoms, until boats or buoys can be placed along the edges of the reefs bordering the channel; for without some such guides it will be difficult for a vessel of large draught to find her way in between the reefs, which contract, in places, to within a cable's length of each other, and are at all times covered.

In entering, steer for the western shore of Kui island until Hele rock is in line with Double-topped mountain (a distant double-topped hill, the second highest of the range), bearing S.E.  $\frac{1}{2}$  S. Steer in on this mark, until Chimney rock bears S.  $\frac{1}{4}$  E.; then for Chimney rock until Rankin or Conde point bears S.W.  $\frac{1}{4}$  W.; then for that point until the port is entered, when anchor, giving the vessel room to swing clear of the reef extending northward of Rankin point, and she will be as snug as if lying in dock, with good holding ground, completely land-locked, and sheltered almost entirely from every wind. (LIEUT. SILAS BENT, U.S.N.)

**SEAH bay**, about 8 miles E.S.E. of Port Oonting, is a beautiful land-locked sheet of water, but the reef fronting the entrance prevents its being accessible to vessels of larger size than the junks which frequent it; within the entrance the water deepens to 12 and 8 fathoms, the bottom being soft mud, and very even. On the southern shore of the bay was found iron ore, mineral coal, and sulphur. The coal appeared of poor quality, and mixed with earth; but good coal might perhaps be found by digging. (LIEUT. WHITING, U.S.N.)

**MATHEWS bay**, near the S.E. end of the Great Lu-chu, is of no practical utility, being filled with coral reefs. In fact, a reef commencing 5 miles from the south point of Great Lu-chu extends, in an unbroken chain, outside all the small islands as far as the N.E. point of Ichey island, with the exception of a narrow

channel between the islet off the N.E. end of Kioka or Kudaka and the island of Taking or Tsukata. Inside this reef, which is of coral formation and bold to approach, is Mathews bay. (LIEUT. G. B. BALCH, U.S.N.)

**NARROW bay** is a deep inlet (bounded by shoals) near the middle of the eastern coast of the Great Lu-chu, and Ichey island forms the south-eastern point of entrance; it is useless for all purposes of navigation, being exposed to the east winds, and swell of the ocean. There is, however, *secure anchorage* in about 15 fathoms water on the western sides of Ichey, and of Hanadi (the next islet to the southward). This is the only place of shelter on the east coast of the Great Lu-chu. There is a village on the south end of Ichey.

**JORI** or *Yori-sima*—**JULO** (island of BASIL HALL—**YOROU** island of French charts—lies N.E.  $\frac{1}{2}$  N. distant 12 miles from the northernmost point of Okinawa-sima. There is a reef on its north and east sides, and another on its west side. Its highest point, 413 feet high, is in about lat.  $27^{\circ} 2' N.$ , long.  $128^{\circ} 26\frac{1}{4}' E.$  The channel between it and Okinawa-sima, as well as that between it and the Montgomery group, is apparently safe.

**JERABU** or *Yerabu-sima*—**WUKIDO** island of BASIL HALL—**OUKIN** island of French charts—lies 18 miles to the northward of Jori-sima; it is  $9\frac{1}{2}$  miles long, E.N.E. and W.S.W., and the S.W. peak (687 feet high) is in about lat.  $27^{\circ} 21\frac{1}{2}' N.$ , long.  $128^{\circ} 34\frac{1}{4}' E.$  There is a safe channel between it and Jori-sima.

**TOK-SIMA**—*Makirouma* of French charts—**CROWN** island of BROUGHTON—is 18 miles N.E.-ward from Jerabu-sima. It is 15 miles long (N. and S.), and 8 miles wide. The highest peak, near the centre (on the east side), has an elevation of 2207 feet, and is in about lat.  $27^{\circ} 45' N.$ , long.  $128^{\circ} 58\frac{1}{2}' E.$ ; to the southward of this there is another peak 1298 feet high. A peak near the centre of the north end, 1860 feet high, with a village on its N.W. face, is in about lat.  $27^{\circ} 51' N.$ , long.  $128^{\circ} 55' E.$  Two small islets named **Tok-sima-utsi** or Middle rocks (166 feet high) lie 2 miles north of the N.E. point of the island. The channel between Tok-sima and Jerabu-sima is apparently safe.

Jori-sima, Jerabu-sima, and Tok-sima are high, well wooded, and appear to be inhabited.

**IWO-SIMA** or **SULPHUR** island lies 34 miles west of the N.W. point of Tok-sima, and 31 miles N.W.-ward from Jerabu-sima,—the channel between them, in each



*Iwo-sima (Sulphur island) North.*

case, being safe. The island is  $1\frac{1}{2}$  miles long N.W. and S.E., and on its N.W. side is an active volcano. The cliffs near the volcano are of a pale yellow colour, interspersed with brown streaks; the ground is very rugged and broken, with here and

there a thin coat of brown grass. The south end of the island is 541 feet high, of a deep blood-red colour, with occasional spots of bright green. It is generally barren, and inaccessible owing to the heavy surf beating on the shores. A pinnacle-shaped rock lies near its S.E. end. The south peak is in lat.  $27^{\circ} 52' N.$ , long.  $128^{\circ} 14\frac{1}{2}' E.$

**OHO-SIMA**.—Ou-sima, Harbour, Bungalow, Preble, or Slocum island—is the largest of the chain of islands lying between Okinawa-sima or Great Lu-chu and Japan. It is about 30 miles in length (N.E. and S.W.), high, well cultivated, and, from the number of villages to be seen along the coast, must contain a large population. There are two peaks on its south end, 1674 and 1420 feet respectively above the sea.

This island was partially surveyed by the U.S. North Pacific squadron in 1855, and by their chart the outline of its coasts appears much broken and deeply indented with numerous bights—most of which are very bold. Wood and water are good and plentiful, but refreshments scarce. The inhabitants are timid and harmless. The north end is high, and being connected with the main part of the island by a narrow low isthmus, it has the appearance, on some bearings, of being isolated. Foul ground appears to extend about  $2\frac{1}{2}$  miles N.E. by E. from the north end, and two rocks to rise from it, the northern of which is about 80 feet high. There are several open bays on the N.W. side of the island; the entrance to Fukau bay, the northernmost, is in lat.  $28^{\circ} 29' N.$  and there is anchorage on its west side. Two boats from the U.S. ship *Mississippi* landed near a village in a bay on the western shore, where there is also good anchorage, but which is entirely exposed to the westward. Sima-u bay, on the east coast, in lat.  $28^{\circ} 16'$ , also affords anchorage.

*Position*.—North extreme of the island, lat.  $28^{\circ} 31' 40'' N.$ , long.  $129^{\circ} 42\frac{1}{2}' E.$ ; south extreme, lat.  $28^{\circ} 6' 30'' N.$ , long.  $129^{\circ} 24\frac{1}{2}' E.$

**WINDS**.—At the conclusion of a gale from the westward dangerous whirlwinds of small extent, coming over the land, reach far to seaward. They may be seen approaching, and can generally be avoided by tacking. U.S. ship *Vincennes* under storm sails, having tried the strength of one, worked between the others into the anchorage of Sima-u.

**Katona-sima**.—The south end of Oho-sima is separated from Katona-sima by a narrow channel (Porpoise strait), in some places not more than half a mile wide. The *Vincennes* anchored at its western entrance, in Vincennes bay, a small bay formed at the north end of Katona-sima. In entering an anchor should be ready to let go, in case of being set too near danger, for the entrance is narrow and the current strong.

**TIDES**.—By three days' observations in Vincennes bay, it was high water, full and change, at 7h. 30m.; and the rise and fall  $5\frac{1}{2}$  feet.

**Yori** or **Jori-sima** and **Uru-sima** are two small islands from  $1\frac{1}{2}$  to 2 miles southward of Katona-sima; a peak in the former is 1002 feet high, and in the latter 1356 feet.

In the vicinity of all these islands are many scattered islets, rocks, and pinnacles, most of which are high and conspicuous.

**KIKAI SIMA** (probably Bungalow island of old charts), lying about 15 miles

S.E.-ward of the north end of Oho-sima, is moderately high, about 7 miles in length, N.N.E. and S.S.W., and inhabited. The summit (867 feet high) is in lat.  $28^{\circ} 18' N.$ , long.  $129^{\circ} 59' E.$  The U.S. Pacific squadron observed a dangerous bank, about 2 miles S. by W. from the S.W. point of the island.

**ANCHORAGE.**—The U.S. ship *Germantown* anchored at  $1\frac{1}{2}$  miles from the shore, in 25 fathoms, coral and shell, with the south-east point of Kikai-sima bearing S.E. by E.  $\frac{1}{2} E.$ , and the south-west point N.  $\frac{1}{2} E.$

The tides here set strong; the ebb from E.N.E. to N.E., and the flood from West to W.N.W. The strength was about 2 knots per hour, with an undertow of at least double that velocity.

**Marsh and Germantown reef.**—In 1853 Capt. MARSH of the *Jenny* reported a reef 7 miles S.W. of Bungalow island (Kikai-sima) extending N.N.E. and S.S.W. about 3 miles, with 12 feet at high water. The U.S. North Pacific Surveying Expedition found this reef to be only  $4\frac{1}{2}$  miles distant from the southern shore of the island, and placed it in lat.  $28^{\circ} 13' N.$ , long.  $129^{\circ} 53' E.$  (corrected  $129^{\circ} 55\frac{1}{4}'$ ).

In March, 1859, the U.S. sloop *Germantown* struck on a shoal, from the shoalest part (1 fathom) the S.E. end of Kikai-sima bore E.N.E. (? N.E.); the S.W. point bore N. by E.  $\frac{1}{2} E.$ ; the highest terrace on the island N.E.  $\frac{1}{4} E.$  6 or 7 miles; and the north point of Oho-sima N.N.W.  $\frac{1}{2} W.$  The reef extends in a N.N.E. and S.S.W. direction about  $1\frac{1}{2}$  miles long, and  $\frac{1}{2}$  a mile wide.

Directly north of this reef at the distance of 2 miles another shoal spot was found, with apparently a clear passage between it and the first reef.

N.B.—In the American chart Germantown reef is placed  $2\frac{1}{2}$  miles S. by W.  $\frac{3}{4} W.$  from the south-west extreme of Kikai-sima, or in lat.  $28^{\circ} 14\frac{3}{4}' N.$ , long.  $129^{\circ} 55' E.$ ; and Marsh reef,  $1\frac{1}{2}$  miles southward of it.

*Tabiyo-saki*, a small islet formerly placed on charts about 2 miles north of Kikai-sima, most probably has no existence; nor has Kikai island in lat.  $29^{\circ} 36' N.$ , long.  $130^{\circ} 25' E.$

**HESPER** island was reported by Mr. JAMES, commanding H.M.S. *Hesper*, in 1864. Thick weather prevented the fixing of its position, but it was estimated to be S.E. by S. distant 18 to 20 miles from Tabiyo-saki, which, if the latter exists and the bearing was from that islet, the position would be about lat.  $28^{\circ} 9' N.$ , long.  $130^{\circ} 16' E.$ —But the bearing was probably from the high and more conspicuous peak (867 feet) of Kikai-sima, in which case the position would be about lat.  $28^{\circ} 3\frac{1}{2}' N.$ , long.  $130^{\circ} 12' E.$  The island appears to be very small. Reefs were also seen from aloft, extending from one to two miles from the S.W. and S.E. points of Kikai-sima.

**SANDON**, Macedonian, or Constantine rocks were discovered by Capt. MARSH of the ship *Viscount Sandon*, 8th December, 1850, on her passage from Singapore to Shanghai, and have since been visited by U.S. ship *Macedonian*. The highest rock resembles a haystack, and is about 33 feet above the sea, with two low detached rocks to the westward, and a reef between them. At a quarter of a cable's length from their north-west side are 12 fathoms water, and at half a mile to the north-west 15 to 22 fathoms, with overfalls over an uneven coral bottom. No other dangers are

visible, and they may be passed at the distance of a mile. Their position is about  $14\frac{1}{2}$  miles N.N.E.  $\frac{1}{2}$  N. from the north point of Oho-sima, in lat.  $28^{\circ} 45\frac{1}{2}'$  N., long.  $129^{\circ} 47\frac{1}{2}'$  E. They are visible at the distance of 7 miles.

An island reported by Mr. MINOR, U.S.N. to be in lat.  $28^{\circ} 42'$  N., long.  $129^{\circ} 42'$  E., is probably Sandon rock.

The **LINSCHOTEN ISLANDS**—called also the PINNACLE or CECILLE archipelago—have been partially examined by the French, the U.S. squadrons, and by various surveying vessels of H.M. service. They extend in a general N.E. by N. and S.W. by S. direction from lat.  $28^{\circ} 45'$  to  $30^{\circ} 5' N.$ , and from long.  $129^{\circ}$  to  $130^{\circ} E.$

**Yoko-sima**—OGLE island of BELCHER—CLEOPATRA island of the French—the southernmost of the group, is small and uninhabited; it is cone-shaped, and evidently



*Yoko-sima (Ogle island), South, dist. 8 miles.*

of volcanic origin—the crater being clearly visible; its main direction is E. and W.; the most elevated part—1700 feet above the sea—is visible 40 miles, and is in lat.  $28^{\circ} 47\frac{1}{2}'$  N., long.  $129^{\circ} 1\frac{1}{2}'$  E.



*Kaminone and Yoko-sima (Ogle island), E., dist. 9 miles.*

An islet, called **Kaminone** or ROYALIST, about  $1\frac{1}{2}$  miles to the northward, is also volcanic, and 972 feet high. There is a clear passage between the two.

The island reported in 1847 by Capt. SULLIVAN of the *Audax*, in lat.  $28^{\circ} 50' N.$ , long.  $128^{\circ} 20' E.$ , with a small islet or rock 2 or 3 miles N.E. of it, and 70 fathoms all round, would appear from the description to answer to Yoko-sima and Kaminone.

**Tokara-sima**—PENNELL island of BELCHER—is small and volcanic; its main direction is N.W. and S.E.; Capt. CHEYNE says it is inhabited, and the north end well cultivated; there are some islets and rocks off its S.W. and E. sides, and off its S.E. extremity; it is 860 feet above the sea, and in lat.  $29^{\circ} 8' N.$ , long.  $129^{\circ} 13\frac{1}{2}' E.$

**Simago**—SABINE and COOPER islets of BELCHER—four in number, extend 3 miles W. by S. and E. by N. with boat channels between them; the westernmost and largest,  $\frac{1}{2}$  of a mile long, N.E. and S.W., is 372 feet high, in lat.  $29^{\circ} 13' N.$ , long.  $129^{\circ} 20\frac{1}{2}' E.$  The easternmost islet bears from it about E.  $\frac{1}{2}$  N., 3 miles.

**Akusi-sima**—ACOUCHEKI—or SAMARANG island of BELCHER—1978 feet above the sea—is 4 miles long E. and W. The shores are generally steep and inaccessible,

except at one spot where there appears to be some cultivated land; the west end, which is bold, high, and thickly covered with wood, is in lat.  $29^{\circ} 28' N.$ , long.  $129^{\circ} 36\frac{1}{2}' E.$ ; there is a small islet off its N.W. face.

**Suwa-sima**—VOLCANO island of BELCHER—ARCHIMEDES island of the French—has an active volcano, 2705 feet high, the summit in lat.  $29^{\circ} 38' N.$ , long.  $29^{\circ} 43' E.$ ;



*Suwa-sima (Archimedes island) S.E.*



*Suwa-sima (Archimedes island), N.E. 15 miles.*

the island is about 5 miles long N.N.E. and S.S.W., and 3 miles wide; the peak near the north end is 1839 feet high, and there is an islet off it.

**Fira-sima**—DISASTER island of BELCHER—VICTORIEUSE island of the French—lies 8 miles to the westward of Suwa-sima; it is small and 812 feet high, in lat.  $29^{\circ} 41' N.$ , long.  $129^{\circ} 32\frac{1}{2}' E.$

**Naka-sima**—PINNACLE island of BELCHER—PACIFIQUE of the French—is 3400 feet high, and an active volcano; the island is 5 miles long N.W. and S.E., and 3 miles wide; off its south end and S.E. side are two small islets, respectively 87 and 86 feet above the sea; the peak is in lat.  $29^{\circ} 52' N.$ , long.  $129^{\circ} 52\frac{1}{2}' E.$

**Kutsino-sima**—JERABOUT of BELCHER—ALCMENE of the French—is 4 miles long N.N.W. and S.S.E.; it is 2230 feet high, and the peak is in lat.  $29^{\circ} 59' N.$ , long.  $129^{\circ} 56' E.$

**Rocks and breakers.**—The channel between Kutsino-sima and Naka-sima is said to have rocks and breakers in it, and the American chart remarks that *probably there is no passage*.\*

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\* Captain Nye of the whaler *Mount Vernon* proceeding from the Bonin islands to the sea of Japan, passed between the Pinnacle islands (lat.  $29^{\circ} 44'$ ) and Yakuno-sima. "The chart showed a safe and clear channel, but I saw two groups of 30 to 40 rocks in the middle of the channel; each group was  $\frac{1}{2}$  a mile long, and 1 mile distant the one from the other; they lie N.E. and S.W., and directly in the track of vessels passing through the channel either way: the rocks vary from 5 to 40 feet above the sea level."

N.B.—This description more nearly corresponds to the Fira-se rocks and reef (p. 148), 7 miles N.E. of Kutsino-sima, in the channel between it and Yakuno-sima, as indeed is probable by the mention of the latter island. Still, it may refer to a danger between Naka-sima and Kutsino-sima, in which case the latter island was mistaken for Yakuno-sima,—and the channel between them, consequently, highly dangerous, if not wholly impassable.

**Kohebi-sima**—FORCADE rock of the French—is 11 miles westward of Naka-sima; the peak, 996 feet high, is in lat.  $29^{\circ} 52\frac{1}{2}'$  N., long.  $129^{\circ} 38'$  E.

**Hebi-sima**—DUNDAS island of BELCHER—ST. FRANÇOIS XAVIER island of the French— $3\frac{1}{2}$  miles N.W.-ward of Kohebi-sima, is 1687 feet above the sea, and has a small islet off its west extremity; the peak is in lat.  $29^{\circ} 54'$  N., long.  $129^{\circ} 33\frac{1}{2}'$  E.

**Firase or Blake rocks and reef**—LAPELIN of the French charts—consist of several islets and pointed rocks, extending about 3 miles N.E. and S.W.; the highest pinnacle, about 92 feet high, is in lat.  $30^{\circ} 4'$  N., long.  $130^{\circ} 3'$  E.

*Medusa reef*, placed on some recent charts at the western entrance of Colnett strait, and 10 miles north of Kutsino-sima, is only known by vague report.

**Colnett strait**, which separates the Linschoten group of islands from the next group to the northward, is safe, and seems to be the best route for a steamer of small power to take when making for the coast of China with strong westerly and N.W. winds. The current, however, must be carefully attended to, especially at night or in thick weather, for it has been found to run with great velocity, 4 or 5 knots, with West and W.S.W. winds. (H.M.S. *Hesper*, 1865.)

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**Islands between Colnett and Van Diemen Strait, southward of  
Kiusiu island, Japan.**

**YAKUNO-SIMA**, 21 miles N.E.-ward from Firase or Blake rocks, is of a quadrangular shape,—15 miles long (N. by W. and S. by E.), and 15 miles wide; on it are several lofty peaks,—the highest, near the centre, towards the S.W. side, has an elevation of 6345 feet, and is in lat.  $30^{\circ} 19\frac{1}{2}'$  N., long.  $130^{\circ} 31'$  E. There is a village (Miya-ura) on its N.E. side, at the head of a small bay. Off its S.W. side is the islet called **Mo-sima**; and off its east side is White rock.

The southernmost point of Yakuno-sima is in lat.  $30^{\circ} 13'$  N., long.  $130^{\circ} 36'$  E., near to which is a peak 2997 feet high.

**Nagarobe island, Yerabu-sima**, or JULIE of the French charts, lies 7 miles westward (northerly) from Nagada cape, the westernmost point of Yakuno-sima, and there is a safe passage between the two. It is a volcano, and has recently shown signs of considerable activity. The outline of the island, which is small, is very irregular; it is 6 miles long W.N.W. and E.S.E., and its greatest breadth is 3 miles; the highest peak, towards its S.E. end, is 2297 feet above the sea, and in lat.  $30^{\circ} 26\frac{1}{2}'$  N., long.  $130^{\circ} 14'$  E.

**TANEGA-SIMA** is the easternmost island of this group; it is 32 miles long, N.N.E. and S.S.W., between lat.  $30^{\circ} 19'$  and  $30^{\circ} 50'$  N. It has not been very critically examined, but its northern end appears to be low, with smooth rounded undulating hills; the centre and southern end is more elevated, and the island generally well wooded. The French chart shows a good harbour on the west side, and the sites of several towns. The highest peak, 1200 feet high, is north of the central part of the island; and towards the south end there is a peak 820 feet high.

The easternmost point (Firwara-saki) is in about lat.  $30^{\circ} 40' N.$ , long.  $131^{\circ} 6' E.$  **Vincennes strait**, between Tanega-sima and Yakuno-sima, is 10 miles wide in the narrowest part.

The following observations are by Mr. A. F. Boxer, H.M.S. *Hesper*:—"At 10 A.M., 5th May, 1865, made Tanega-sima, the southern part of which is high and table-land. On approaching its S.E. point observed some rocks, and a shoal about 2 miles S.S.E. from them; the whole nearly 7 miles from the S.E. point of the island. When the south point of Tanega-sima bore North about 8 miles, and the south point of Yakuno-sima W. by N. struck soundings in 8 fathoms, rocky bottom; the next cast no bottom in 13 fathoms.

"To clear these dangers, the south point of Yakuno should not be brought westward of W. by N. until the high rock off the S.E. point of Tanega bears N.  $\frac{1}{2}$  W. This rock, which is about 50 or 60 feet high, and a conspicuous object when passing through Colnett strait, appeared to lie 3 to  $3\frac{1}{2}$  miles off the point."

The *Vincennes*, of the U.S. North Pacific Surveying Expedition, rounded close to the S.E. point of Tanega-sima, and saw no other rocks than a conspicuous one, 80 feet high, 1 mile off the point, with some other rocks inside of it, and to the northward. A reef projects to the northward from Kisika-misaki, the N. point of the Tanega-sima.

**Take-sima**, a small island 241 feet high, is placed on the American chart in lat.  $30^{\circ} 43\frac{1}{2}' N.$ , long.  $130^{\circ} 52' E.$

**Seriphos** or Omuru is marked on the French charts as a rock under water, in lat.  $30^{\circ} 44' N.$ , long.  $130^{\circ} 45' E.$ ; in the English Admiralty charts it is placed in lat.  $30^{\circ} 49' N.$ , long.  $130^{\circ} 45' E.$

**Take-sima**, **APOLLOS** of the French charts, is about 2 miles in circumference, and 816 feet high; a rocky spit extends  $\frac{1}{4}$  of a mile from its east extremity; the peak is in lat.  $30^{\circ} 48\frac{1}{2}' N.$ , long.  $130^{\circ} 26\frac{1}{2}' E.$  A dangerous shoal has been reported a short distance north of the island.

**Two** or **Iwoga-sima**—**IS. DU VOLCAN** of the French—is an active volcano, and its peak (2469 feet high) is in lat.  $30^{\circ} 47' N.$ , long.  $130^{\circ} 19' E.$ ; some rocks and reefs extend about  $\frac{1}{2}$  of a mile from the east and N.E. points of the island.

**Powhatan reef and rocks**, in lat.  $30^{\circ} 42' N.$ , long.  $130^{\circ} 22' E.$ , were discovered by U.S. frigate *Powhatan*, January, 1860. From the centre rock, which is about 18 feet above the sea, the S.W. point of Iwoga-sima bears N.W.; the east point of Iwoga-sima N.  $\frac{1}{2}$  W.; and the east point of Take-sima N.E.  $\frac{1}{2}$  N. (*Var.*  $2\frac{1}{2}^{\circ}$  W.). Other rocks were seen awash, or a few feet above the water, stretching out about  $\frac{1}{2}$  of a mile from the centre rock.

**Use** or **Trio rocks** are three distinct islets of equal height on the one reef; the central islet, 206 feet high, is in lat.  $30^{\circ} 44\frac{1}{2}' N.$ , long.  $130^{\circ} 7' E.$

**Kuro-sima**—**Ste. CLAIRE** of the French charts—is rather larger than Iwoga-sima and Take-sima; its peak is 2160 feet above the sea, and is in lat.  $30^{\circ} 50' N.$ , long.  $129^{\circ} 56\frac{1}{2}' E.$  There is a conspicuous detached rock (Tower rock) close to its east side.

**Kusakaki-sima**, variously named Ingersoll, Morison, and Larne rocks, eight in number, extend N.E. and S.W. about  $5\frac{1}{2}$  miles. The N.E. rock is about 396 feet high; and the central and loftiest one, 468 feet above the sea, is in lat.  $30^{\circ} 51' N.$ , long.  $129^{\circ} 26' E.$ , and visible 25 miles.

**Van Diemen strait** lies to the northward of Tanega-sima, Make-sima, Take-sima, and Iwoga-sima,—between them and Kiusiu island. The channel is perfectly safe. A shoal spot of 8 fathoms has been observed a short distance to the southward of Satano-misaki (cape Chichakoff, or Tshitshagov). Approaching the strait from the westward, mount Horner (3069 feet high) on Kiusiu island to the northward, and Iwoga-sima (2469 feet) to the southward, form two conspicuous landmarks.

The **Monsoons** reach the southern and western shores of Japan, and consequently all the islands just described (pp. 123–150). The whole region from Formosa to the Bonin islands is within the track of **Typhoons**, though they seldom reach Japan on their westerly progression; but the Japan sea lies in a region through which these storms travel in a direction between north and east, after they have recurved. They may be expected between May and November, inclusive.

**ISLANDS, ROCKS, SHOALS, &c., FOUND SOUTHWARD FROM THE  
S.E. POINT OF NIPON ISLAND (JAPAN) TO LAT.  $29\frac{1}{2}^{\circ} N.$ ,  
LONG.  $142\frac{1}{2}^{\circ} E.$  (THE VICINITY OF LOT'S WIFE).**

**LOT'S WIFE.**—This is probably the Vela rock (in lat.  $29^{\circ} N.$ , long.  $142\frac{1}{2}^{\circ} E.$ ) of old Spanish charts; and has frequently been reported as Sail rock, Lot's Wife, Armstead peak, Ormsby rock, Black rock, &c.

Capt. **SOMERBY** of the *Isabelita Hyne* (1853) describes it as “200 feet high and 100 feet at the base; black, and having the appearance of a bottle; no bottom within 3 miles of the rock; it would be dangerous to strike it, as there is but little chance of getting on the rock, and if gained there is not a vestige of vegetation on it.”

The U.S. ship *Macedonian* (1854) describes it as “a tall pinnacled rock, rising 250 feet above the sea, visible 25 miles, and bearing a remarkable resemblance to a ship under full sail.” A cast of the lead within 8 miles of the rock gave no soundings with 160 fathoms.



*Lot's Wife,*  
N.W.  $12\frac{1}{2}$  miles. (*Vincennes*.)



*Lot's Wife,*  
N.  $\frac{1}{2}$  W.  $2\frac{1}{2}$  miles. (*Vincennes*.)

The U.S. ship *Vincennes* (1854) passed very close to it in bad weather, when no sights could be taken; but the dead reckoning agreed with the position assigned it

by the *Macedonian*. The look-out had at first reported a sail which proved to be this rock; its altitude was calculated to be 299 feet, and its base 40 feet.

*Position*.—The U.S. ship *Macedonian* made it in lat.  $29^{\circ}47'N.$ , long.  $140^{\circ}22'30''E.$ ; —and the mean of all the other positions given by various seamen (and which approximate to each other), the *Macedonian's* being included, places it in lat.  $29^{\circ}42'N.$ , long.  $140^{\circ}20'E.$ \*

**DOUBTFUL ISLANDS**.—*Haystack rock*, cited by KRUSENSTERN and placed in lat.  $29^{\circ}58'N.$ , long.  $137^{\circ}50'E.$ ; and an *island* in lat.  $30^{\circ}N.$ , long.  $141\frac{1}{2}'E.$ , are unknown; the latter position was examined by U.S. ship *Macedonian*, and they "felt assured no island existed near it."

Lot's Wife being nearly midway between the two positions, the reports may possibly refer to that rock.

**PONAFIDIN** or **St. Peter island** was discovered in 1820 by Lieut. PONAFIDIN of the Russian navy, and, from its apparently having three hummocks on it, was

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\* Lieut. RODGERS, who commanded the U.S. North Pacific Surveying Expedition, appends the following note to the sketch of Lot's Wife on the chart issued by the United States government.

"This rock was discovered by Capt. JOHN MEARES of the British ship *Felice* on April 9th, 1788, and called by him 'Lot's Wife.' It has been seen by the U.S. ships *Macedonian* and *Vincennes*.

"On board the *Felice* it was first taken for a sail. On board the *Macedonian* the same thing occurred April 30th, 1854. In the *Vincennes* the look-out reported a sail which proved to be the same rock.

Latitude by MEARES . . . . .	$29^{\circ}50'N.$
Latitude by U.S. ship <i>Macedonian</i> . . . . .	$29^{\circ}47'$
Difference	0 3

"The position by MEARES in the text of his book is nearly right as to latitude but wrong in longitude.

Longitude by text of MEARES' voyage . . . . .	$142^{\circ}23'00''E.$
„ U.S. ship <i>Macedonian</i> . . . . .	$140^{\circ}22'30''$
MEARES' error in text . . . . .	2 0 30
Longitude by MEARES' chart accompanying his book . . . . .	$156^{\circ}00'00''E.$
„ U.S. ship <i>Macedonian</i> . . . . .	$140^{\circ}22'30''$
Error in chart . . . . .	16 37 30

"This discrepancy is curious, and may be explained by the following note in the errata preceding the narrative of his voyage: 'The ship's latitudes and longitudes read as they were kept by the reckoning, but in the charts as they were inferred by correct observations and the lunar method of finding the longitude at sea.'

"The reckoning was  $120\frac{1}{2}$  miles out, but the correct observations and lunar method  $15^{\circ}37'30''$ .

"The Borodino islands bear from Lot's Wife W.  $25^{\circ}$  S., distant 570 miles (*Vincennes*).

"The Grampus islands bear from Lot's Wife W.  $27\frac{1}{2}^{\circ}$  S., distant 600 miles (MEARES' chart).

"There is thus a moral certainty that Grampus islands are identical with Borodino islands, and Grampus islands should be erased from the charts."

It is, however, by no means certain that the Lot's Wife described above is the Lot's Wife of MEARES, and the discussion on this subject will be found on pp. 159-163.

named Three Hills: the following year it was visited by Lieut. PONAHLIVIN, also of the Russian navy, who describes it as being in shape like a truncated cone. It has been variously described as "a high island," "an island moderately elevated, with uneven appearance," and "as showing three peaks."

*Position*.—By Lieut. PONAFLIDIN, lat.  $30^{\circ} 29' N.$ , long.  $140^{\circ} 6' E.$ ;—by Lieut. PONAHLIVIN, lat.  $30^{\circ} 32' N.$ , long.  $140^{\circ} 25' E.$ ;—U.S. Japan squadron (1853) lat.  $30^{\circ} 33' N.$ , long.  $140^{\circ} 15' E.$ ;—by brig *Hannah Cheever*, lat.  $30^{\circ} 42' N.$ , long.  $140^{\circ} 6' E.$ ;—by Capt. STICKNEY (*Sarah Warren*), lat.  $30^{\circ} 42' N.$ , long.  $140^{\circ} 30' E.$ ;—by Capt. NEAL (sch. *Wilson*), lat.  $30^{\circ} 40' N.$ , long.  $140^{\circ} 38' E.$ ;—by ship *Claremont*, lat.  $30^{\circ} 33' N.$ , long.  $140^{\circ} E.$ ;—by *Rebecca*, cited by KRUSENSTERN, lat.  $30^{\circ} 33' N.$ , long.  $139^{\circ} 37' E.$ —*Mean of positions* (rejecting long. by *Rebecca*), lat.  $30^{\circ} 35\frac{1}{2}' N.$ , long.  $140^{\circ} 17' E.$

DOUBTFUL ISLANDS.—*Todos los Santos island*, placed on old Spanish charts in lat.  $30^{\circ} 45' N.$ , long.  $143^{\circ} 50' E.$ , and in more recent charts in lat.  $30^{\circ} 45' N.$ , long.  $139^{\circ} 10' E.$ , is unknown; the latter position was in the track of U.S. ship *Lexington*, and no indications of land were seen.

*St. Thomas or San Tomas island*, placed on old Spanish charts in lat.  $30\frac{1}{2}^{\circ} N.$ , long.  $146^{\circ}$  to  $147^{\circ} E.$ , and in more recent charts in lat.  $30\frac{1}{2}^{\circ} N.$ , long.  $142\frac{1}{2}^{\circ} E.$ , is unknown; Capt. KEYSER of the *Undine* reports sailing directly over the latter position without seeing anything.

*Todos los Santos* and *San Tomas* may possibly be Ponafidin island.

**SMITH island**.—Capt. STICKNEY of the *Sarah Warren*, March 26th, 1851, after making Ponafidin island, saw on the same day a high steep rock resembling a ship under full sail, and a few yards eastward of it another small rock upon which the sea broke furiously; it bore N. by W.  $\frac{1}{2}$  W., distant 8 or 9 leagues from Ponafidin.

The same rock was seen August 28th, 1851, by Capt. SMITH of the *Heber*; he describes it as an island small and bare, about 250 feet high, in lat.  $31^{\circ} 12' N.$ , long.  $139^{\circ} 55' E.$

H.M.S. *Tribune*, January 18th, 1859, passed a high pinnacle-looking rock about  $\frac{1}{2}$  of a mile in circumference, in lat.  $31^{\circ} 18' N.$ , long.  $139^{\circ} 50' E.$ , with heavy breakers extending apparently  $\frac{1}{2}$  of a mile from it, and a small rock close to its north side.

The three descriptions appear to refer to the same island or rock, and it is probably the *San Mateo* of the old Spanish charts.

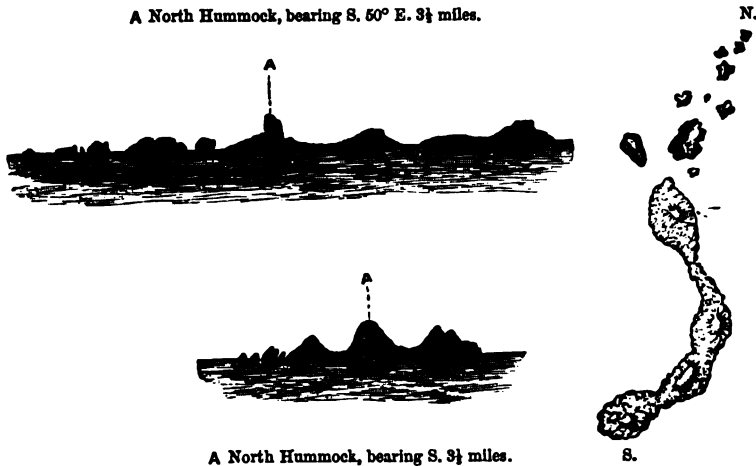
*Position*.—Mean of the two given, lat.  $31^{\circ} 15' N.$ , long.  $139^{\circ} 52\frac{1}{2}' E.$

**Jeannette or San Francisco island**.—The former cited by KRUSENSTERN, is placed in lat.  $31\frac{1}{2}^{\circ} N.$ , long.  $140^{\circ} E.$ ; and the latter was reported in lat.  $31^{\circ} 35' N.$ , long.  $140^{\circ} 40' E.$ ; the ship *Hurricane*, Sept. 3rd, 1852, also reported a rock 1200 feet high in lat.  $31^{\circ} 50' N.$ , long.  $140^{\circ} 23' E.$ ; these doubtless refer to the same island, and the *mean of the positions* gives lat.  $31^{\circ} 38' N.$ , long.  $140^{\circ} 21' E.$ ; but all the reports may possibly relate to Smith island.

DOUBTFUL ROCKS and REEFS.—*Clerck's reef*, cited by KRUSENSTERN, in lat.  $31\frac{1}{2}^{\circ} N.$ , long.  $137^{\circ} 50' E.$ , and a reef (newspaper report) in lat.  $31^{\circ} 42' N.$ ,

long.  $141^{\circ} 10' E.$ , are unknown in those positions; as is a rock in lat.  $31^{\circ} 9' N.$ , long.  $138\frac{1}{2}^{\circ} E.$ , recorded by KRUSENSTERN.

**BAYONNAISE** island was seen by Capt. JURIEN DE LAGRAVIERE of the French frigate *Bayonnaise*, May 31st, 1850:—"It is a curvilinear islet 125 yards long, with several hummocks on it, the highest being near the north end, and not



*Bayonnaise* island—Plan and Views. (Jurien de Lagraviere.)

exceeding 20 feet. Some rocks extend 30 yards to the N.W., and others 75 yards to the N.E. of it. Seen from the north, three hummocks are visible, the central (or northernmost) one being the highest; seen from the N.W. the northern hummock assumes a columnar appearance. Its position was found to be,—lat.  $32^{\circ} 0' 41'' N.$ , long.  $139^{\circ} 59' 20'' E.$ "

In the same year, but later, it was seen by Capt. VAN BRAAM SCHOUCKGWL of the Dutch corvette *Courier*, and named WILLIAM III. island. He describes it as "a small and rocky islet visible from deck at the distance of 2 or  $2\frac{1}{2}$  leagues; the sea breaks furiously on the island; and there is no discoloured water, nor any soundings on the west and south side at the distance of a league from it. Position—lat.  $31^{\circ} 52' 48'' N.$  long.  $139^{\circ} 58' 46'' E.$

Other reports, notably those of the *Euphrosine*, *Europa*, *Frigate Bird*, *Raselas*, and *Flavius*, concur in the descriptions given above; and it has further been assigned to lat.  $31^{\circ} 56' N.$ , long.  $140^{\circ} 10' E.$ ,—to lat.  $31^{\circ} 59' N.$ , long.  $139^{\circ} 55' E.$ ,—and to lat.  $31^{\circ} 59' N.$ , long.  $140^{\circ} E.$

The mean of the five positions is lat.  $31^{\circ} 57\frac{1}{2}' N.$ , long.  $140^{\circ} 1' E.$ , which is probably correct within  $1'$  or  $2'$  of lat. and long.;—but it has also been reported (erroneously) as much as  $20'$  further east, and  $30'$  further west.

This is very probably the Peña de los Picos (rock with the peaks) of the old Spanish charts, placed in lat.  $32^{\circ} 25' N.$ , long.  $150^{\circ} E.$

**AOGA-SIMA** or *South island* of **VEIES** is 3 miles long (N.N.E. and S.S.W.), and visible 36 miles in clear weather. Its coasts are steep; and the only landing place is on the east side, where there is a rock level with the water at a little distance from the land. The island is inhabited, and cultivated on the north and N.W. side. Capt. **WARD**, H.M.S. *Actæon* (1861) from a true bearing of it from *Fatsizio*, and the difference of latitude from a Japanese chart, assumed the eastern summit to be in lat.  $32^{\circ} 27\frac{1}{2}'$  N., long.  $139^{\circ} 49'$  E.

*Caution.*—Previous to this approximate determination of the position of *Aoga-sima* by the *Actæon*, an island or large rock had been frequently reported in the vicinity,—as *Lovett* or *Eagle rock*, *South island*, *Drescher* or *Walter island*, *Grove island*, *Tibbitt* or *High island*, and *Flavius island*, the mean of the six positions being  $32^{\circ} 23'$  N.,  $139^{\circ} 42'$  E. These are noticed in order to draw attention to the fact of Capt. **DRESCHER** reporting *some rocks* 10 to 15 feet high, on which the sea broke with violence, S.E. by S. distant 4 miles from the island.

**FATSIZIO Island**, 24 miles north of *Aoga-sima*, and the southernmost of the islands visited by H.M.S. *Actæon* in 1861, is  $8\frac{1}{2}$  miles long, N.W. by N. and S.E. by S., and 4 miles wide at its broadest part. In shape it is nearly an oblong, rounded at the north-west end, while at its south-east end a slight curve forms a bay, the spot of observation in which (close to some small huts) is in lat.  $33^{\circ} 4' 24''$  N., long.  $139^{\circ} 50' 24''$  E. Anchorage was obtained off this bay in 16 fathoms, sand and gravel, at less than a mile from the shore, but quite exposed from S.S.W. to N.N.E., and a vessel would always be liable to experience a heavy swell. There were 30 fathoms, dark sand, at about 2 miles off this shore, but the rest of the coast line appeared to share the bold features and to be as steep-to as the generality of these islands. High water at F. and C. at 6h., rise of springs 5 feet.

This island is a Japanese penal settlement. Its highest part is the northern, where a mountain reaches an elevation of 2846 feet. At the base of this mountain and creeping up for some distance on its west side is an extensive settlement, while in several places along both shores are found little hamlets and villages, so that the island would appear to support a considerable population. A tract of low land in the centre of and extending across the island is well cultivated. To the southward of this the land again assumes a considerable elevation, but does not reach the altitude of the northern part. The N. peak is in lat.  $33^{\circ} 8'$  N., long.  $139^{\circ} 48'$  E.

**WATER.**—At the south-east end of *Fatsizio* are two or three small streams of delicious water falling down the rocks, and in fine weather and smooth water boats may readily obtain an abundant supply.

There is no bottom, with 55 fathoms, 2 miles west of *Fatsizio* island, but at the distance of 10 to 12 miles to the southward, in the direction of *Aoga-sima*, there is bottom at 85 fathoms, dark grey sand.

**KODSINE** is a small and nearly oval-shaped island, 1826 feet high,  $1\frac{1}{2}$  miles long, and nearly 1 mile broad, lying westward of the highest part of *Fatsizio*, and separated from that island by a channel about 2 miles wide, which has not yet been sounded. Some small rocks are found quite close in shore, as also on the *Fatsizio* side, but no off-lying dangers are at present known, and the lead gives no soundings at 53

fathoms, a little more than a mile from its western shore. A small population is to be found on the lower part of the island.

**KAWAWA** or **Broughton rock**, 17 miles S.W. from Mikura island, is in lat.  $33^{\circ} 39' N.$ , long.  $139^{\circ} 18' E.$ , is a small, isolated and inaccessible islet about 65 feet high, flat topped, and with vertical sides except from one view, which presents a broken outline or step; at about a third of a mile from its N.E. side no soundings could be obtained with 180 fathoms line. The American chart makes it 345 feet high.

The northerly current in the neighbourhood of this islet was found to be particularly strong, running nearly 4 knots an hour.

**MIKURA island**—**PRINCE** island of old charts—is high and bold, and lies 17 miles north-eastward of Broughton rock, in lat.  $33^{\circ} 52' N.$ , long.  $139^{\circ} 36' E.$  There are several detached islets or rocks close to it. The American chart makes its peak 2837 feet above the sea.

**MIAKI island**—the **VOLCANO** island of earlier charts—lies 10 miles northward from Mikura, and is like it, high and bold. The peak (2722 feet high by the American chart) is in lat.  $34^{\circ} 5' N.$ , long.  $139^{\circ} 32' E.$  **VRIES** passed between this island and Mikura.

There is a *cluster of rocks* about  $2\frac{1}{2}$  miles to the S.W.-ward of Miaki; and **BROUGHTON** says "there are some *black rocks* 2 or 3 miles from the eastern point of the island." The American chart places *some rocks*  $9\frac{1}{4}$  miles S.E. by E. from Miaki, and 9 miles N.E.  $\frac{1}{2}$  N. from Mikura.

Miaki is probably the Volcan island of old Spanish charts, and was supposed to be an extinct volcano, but it was active in 1865.

**Onohara islet** lies W.S.W., distant 6 miles from Miaki island; it is very small, but from a distance appears to maintain the usual bold characteristics of the other islands.

**SANBON-TAKE**, **Inaniwa** or **Redfield rocks** are the most western of the chain of islands and rocks south of the Gulf of Yedo, and the most dangerous of the whole group. They consist of two patches of black rocks extending nearly 3 miles N.N.E. and S.S.W., and have deep water all round them. The southern rocks, in lat.  $33^{\circ} 58' N.$ , long.  $138^{\circ} 46' E.$ , are the highest, about 20 feet above high water, while the northern are only about half that height. Nearly midway between the patches is a flat rock, over which the sea breaks heavily, and the heads of two or three small rocks crop up around it. There is said to be deep water between the flat rock and the northern patch, and the channel is reported to be clear, but except in a case of sudden emergency it would not be prudent to attempt passing through.

The hand lead will afford no warning when approaching this dangerous cluster, and in thick weather the islands in the vicinity, the nearest being Kosu-sima, N.E.  $\frac{1}{2}$  E. 20 miles distant, would not be seen; in fact, seeing the islands the dangers themselves would be visible, and therefore easily avoided.

A depth of 70 fathoms, gravelly bottom, was obtained about 4 miles northward of the rocks, but the soundings increased as they were approached, and at 2 miles west

of their centre there was no bottom at 130 fathoms. The current in their vicinity set on one occasion about N. by E., and its rate was 2 to 3 knots.

More recently (1866) Commander BULLOCK states "that as little as 12 fathoms were found when passing along the west side of these rocks, about equidistant from either group; therefore it is not correctly stated that the water deepens as they are approached. At  $\frac{1}{2}$  a mile from the south and principal cluster are soundings of 30 fathoms, rocks. The flat rock also is connected with the south rock, and lies close to them.

*Caution.*—Capt. LEGOE of the *Celestial*, in 1860, reported a sunken rock on which the sea broke heavily, N.N.E. about 3 or 4 miles from the Redfield rocks.

**KOSU-SIMA**, in lat.  $34^{\circ} 13' N.$ , long.  $139^{\circ} 10' E.$  (centre), and elevated 2000 feet above the sea (1849 feet by the American chart), is  $3\frac{1}{2}$  miles long N.E. and S.W., and may be recognised by a remarkable snow white cliff on its western side, and a white patch on its summit, to the northward of the cliff. There is a safe channel 15 miles wide between Kosu-sima and Miaki.

Two small rocky islets (on Japanese authority) lie close together about  $\frac{1}{2}$  a mile off the centre of the eastern shore of Kosu-sima. Also about 2 miles southward of the S.W. point are **Onghashi** or the **Brood rocks**, which should be given a safe berth, as their jagged appearance would lead to the belief that there are many hidden dangers in their immediate neighbourhood.

**SIKINE-SIMA** is low, with a small islet off its north end. It is  $1\frac{1}{2}$  miles long N.N.E. and S.S.W., and lies 5 miles north-east of Kosu-sima. One of the vessels of the American squadron passed between these islands and saw no danger, hence it may be concluded the channel is safe.

**NII-SIMA**, or **Tosi-sima** is about  $1\frac{1}{2}$  miles N.E. of Sikine, and from its broken outline appears from a distance as several islands. Its extent is 5 miles, north and south; and its most elevated part, 1496 feet above the sea (1292 feet by the American chart) is in lat.  $34^{\circ} 23\frac{1}{2}' N.$ , long.  $139^{\circ} 17' E.$  There is a small low islet (**Chi-nai-sima**) a short distance off its S.E. point.

**Utone** or **Peaked islet** is conical, 680 to 700 feet high, lying N.  $\frac{1}{2}$  E., about  $2\frac{1}{2}$  miles from Nii-sima; detached rocks lie near its shores.

**TO-SIMA**, bearing N.  $\frac{1}{2}$  W. 2 miles from Utone, is one mile in diameter, pyramidal-shaped, and its summit 1736 feet above the sea.

**OÖ-SIMA** or **Vries island**, the largest and most northern of the chain fronting the Gulf of Yedo, is 10 miles N.N.E. of To-sima, its S.E. point being in lat.  $34^{\circ} 39\frac{1}{2}' N.$ , long.  $139^{\circ} 27\frac{1}{2}' E.$  The island is oval-shaped, about 8 miles in extent N.N.W.  $\frac{1}{2}$  W. and S.S.E.  $\frac{1}{2}$  E., and 5 miles wide; its summit attains an elevation of 2570 feet. At its centre is an active volcano, over which a white vapour-cloud is generally floating, and frequently, at night, it brightly reflects the glare of the subterranean fires at work in the crater beneath, forming in clear weather a conspicuous landmark visible by night or day for many leagues.

The sloping sides of the mountain are extensively cultivated and dotted with

villages, and there is a considerable population. The coast line is free of all danger, with the exception of a few detached rocks and boulders lying close to it. The principal village is on the north side, off which a narrow bank of soundings affords a precarious anchorage in 12 to 18 fathoms. Another considerable village, having the advantage of a junk harbour, is situated at the south-east point of the island. Landing may be effected at the north village or in the junk harbour. The inhabitants were civil and hospitable, but averse to strangers visiting the volcano.

**Caution 1.—Current :—**The current sets strongly to the northward and eastward through the various passages between the islands off the S.E. end of Nipon, fronting Yedo gulf, and is of course disturbed in its regularity by the obstructions of the islands. This should be borne in mind, particularly in bad weather.

**Caution 2.—The Kuro-Siwo** or Japan current has been described in the Introduction, pp. 77-84, and should be carefully studied; its irregularity, especially in strength, has been the cause of a wonderful amount of discrepancy in the position of the islands between Formosa and Japan.

**MIKO MOTO** or **Rock islet**,  $\frac{1}{2}$  of a mile in length and about 120 feet high, lies E. by S.  $\frac{1}{2}$  S., distant 5 miles from Iro-o-saki or Cape Idsu—on which a *fixed* (wood-fire) light is established. The shores of the islet are precipitous, and the summit is clothed with grass, weeds, and moss. Between the islet and the mainland are the **Uona** and other rocks and ledges, some of them only 2 miles from Rock islet. The channel between Rock islet and Uona rocks has soundings varying from 14 to 30 fathoms, except a patch of 9 fathoms distant 3 cables north of the islet. The tides are uncertain, the N.E. current (which is not to be relied on) running sometimes 3 to 4 knots per hour; at other times regular tides have been observed, the flood setting W.S.W., the ebb E.N.E.  $1\frac{1}{2}$  miles per hour. To the N.W. and north of Rock islet, there are overfalls caused by the tides passing over very uneven bottom. The largest of the Uona rocks is about 70 feet high. The channel should not be used unless in cases of urgent necessity.

**Portsmouth breakers**, reported by Capt. FOOTE, U.S. steamer *Portsmouth*, were stated (by observation) to be in lat.  $34^{\circ} 14'$  N., long.  $138^{\circ} 17'$  E.; they were described as a line of breakers 13 miles distant from the nearest land, extending N.N.E. and S.S.W. from 3 to 5 miles, seen from a distance of 3 miles.

Commander BULLOCK, R.N. (H.M.S. *Serpent*, 1866) says: "Soundings taken near the reputed position of these showed no indication of any shoal, but on approaching Omae-saki (the cape of low sand-hills on the west side of Suraga gulf, and on which is a lighthouse), from the S.E. by E., the depth, which was 71 fathoms at 12 miles distance, and 57 at 9 miles, increased to 129 at  $7\frac{1}{2}$  miles, again decreasing to 40 at 5 miles, shelly bottom.

**Lady Inglis rocks and reef**, originally reported to lie about S.S.E., distant 6 miles from Omae-saki, "are 2 miles E. by S. of its southern point, separated by a 6-fathom channel; a vessel may pass inside by giving the shore a berth of a mile; the reef quite covers at high water, and does not always break. (COMMANDER BULLOCK, 1866.)

**SCATTERED ISLANDS, ROCKS, REEFS, AND REPORTED DANGERS  
IN THE WEST PACIFIC—WEST OF LONG. 180°—BETWEEN  
LAT. 50° N. AND 10° N.**

*Three islands*—a newspaper report—in lat. 38° 49' N., long. 152° 24' E., seem improbable.

*An island*, 9 miles long, without vegetation, in lat. 35° 21' N., long. 141° 42' E., reported by Capt. STANLEY of the *Palmetto*, is improbable: the position is 45 miles S.E.-ward from Cape Inaboye on the east side of Nipon. On some charts this island is placed a degree more to the north.

*Sixty-four fathom bank*, reported to be in lat. 36° 25' N., long. 179° 30' E. (*China Mail*), and in lat. 34° 25' N., long. 179° 30' E. (*Alta California*),—also *Melish bank*, a whaler's report, in lat. 34° 25' N., long. 178° 47' E.,—seem to indicate soundings somewhere between lat. 33° and 35° N., and between long. 178° and 180° E.;—the mean of the latter two positions gives lat. 34° 25' N., long. 179° 8' E.

*Rede shoal*, placed on charts in lat. 34° 20' N., long. 142° 5' E., seems improbable in that position.

*Rica de Plata*, in lat. 33½° N., long. 167° E., is an island found on old Spanish charts near the track of the *Atapulco* galleons, and a whaler's report has since placed an island in lat. 33° 56' N., long. 169° 15' E.;—also, *Crespo island*, reported in 1801 by Capt. CRESPO of the galleon *El Rey Carlos*, was said to have been seen 10 leagues off, in lat. 32° 46' N., long. 170° 10' E., and a whaler's report gives an island in lat. 33° 3' N., long. 170° 7' E.;—thus, it is possible there may be an island in about lat. 33° 15' N., long. 169° 50' E.

*Weeks reef*.—Of this reef, a whaler's report, placed on charts in lat. 32° 55' N., long. 152° 40' E., nothing is known beyond BOWDITCH's statement that it extends N.E. and S.W. 36 miles.

*A reef* placed on charts in lat. 32° N., long. 147° 20' E., is very doubtful.

*Grove rocks*, reported by Capt. GROVE of the *Live Yankes* as a cluster of rocks about 40 feet high, in lat. 31° 58' N., long. 149° 45' E., may from the description be Bayonnaise island (*see* p. 153),—the report being ten degrees in error.

*Ganges reef or island*.—The following have been reported in the vicinity of lat. 31° N., long. 154° E., viz.—a reef in lat. 31° 30' N., long. 154° E.;—a shoal in lat. 31° 30' N., long. 153° E.;—a reef in lat. 31° 18' N., long. 153° 20' E.;—*Wake island*, in lat. 31° 14' N., long. 155° E.;—an island, in lat. 31° 5' N., long. 154° 15' E.;—an island in lat. 31° N., long. 155° E.;—an island in lat. 31° N., long. 154° 40' E.;—*Ganges reef*, in lat. 30° 47' N., long. 154° 15' E.;—an island, in lat. 30° 40' N., long. 155° E.;—a shoal in lat. 31° 30' N., long. 153° 20' E.

These are chiefly whalers' reports, and clearly indicate danger somewhere in the locality of the mean position, about lat.  $31^{\circ} 10' N.$ , long.  $154^{\circ} 10' E.$

*Moor island*, reported by Capt. MOOR, and cited by KRUSENSTERN and ARROW-SMITH, placed on charts in lat.  $31^{\circ} 27' N.$ , long.  $145^{\circ} 40' E.$ , seems improbable.

*Sylph rock*, reported in 1812 by M. DOBELL, Russian consul at Manila, and placed on charts in lat.  $31^{\circ} 25' N.$ , long.  $142^{\circ} 40' E.$ , seems improbable; he had no instruments to determine the longitude astronomically. •

*An island*, whaler's report, in lat.  $31^{\circ} 19' N.$ , long.  $160^{\circ} 42' E.$ , also in lat.  $31^{\circ} 20' N.$ , long.  $160^{\circ} 10' E.$ , is otherwise unknown.

*An island*, whaler's report, in lat.  $31^{\circ} N.$ , long.  $147^{\circ} 16' E.$ , is otherwise unknown.

*An island*, whaler's report, in lat.  $31^{\circ} N.$ , long.  $144^{\circ} 24' E.$ , is otherwise unknown.

*Rica de Oro*, on old Spanish charts, in lat.  $30^{\circ} N.$ , long.  $161^{\circ} E.$ ,—and on later charts in lat.  $29^{\circ} 50' N.$ , long.  $157^{\circ} 4' E.$ , was at one time supposed to be identical with Lot's Wife of MEARES (see below); but on the most recent charts neither of these rocks is inserted in the position just given.

*A group of islands* said to lie in lat.  $30^{\circ} N.$ , long.  $144^{\circ} 30' E.$ , is otherwise unknown and improbable. The same remark applies to islands, whalers' reports, in lat.  $30^{\circ} N.$ , long.  $148^{\circ} E.$ ;—in lat.  $30^{\circ} N.$ , long.  $146^{\circ} E.$ ;—in lat.  $30^{\circ} N.$ , long.  $144^{\circ} 23' E.$ ;—in lat.  $30^{\circ} N.$ , long.  $143^{\circ} E.$ ;—and in lat.  $29^{\circ} 35' N.$ , long.  $143^{\circ} E.$

**MORRELL island and reef.**—The island is generally placed in lat.  $29^{\circ} 57' N.$ , long.  $174^{\circ} 31' E.$ : it was described by Capt. MORRELL as low, nearly level with the water, of volcanic origin, and about 4 miles in circumference; sea fowl and sea elephants were abundant, as were turtle (in July).

A reef runs off about 15 miles from the west side of the island, and another 30 miles in a S.S.E. direction from the S.E. side. The reefs are of coral, affording good anchorage on the S.W. side; but the water is deep close to the east side.

**MEARES rock (LOT'S WIFE of MEARES) and the GRAMPUS islands.**—In 1788 MEARES, during one of his commercial voyages in the North Pacific, saw some islands and subsequently an isolated rock the positions of which have not been exactly determined, but he gives the following details respecting their discovery:—

I. In the "Narrative" of his voyage he says that,—"On the 3rd of April, 1788, the weather became moderate, and the storm subsided; but about noon the wind shifted to N.W., and blew with extreme violence, accompanied by a strong and mountainous sea. Our course was to the E. by N., under close-reefed topsails and foresail, in lat.  $24^{\circ} 56' N.$ , long.  $143^{\circ} 39' E.$  of Greenwich.

"Towards night it again moderated, when we made sail. The wind now shifted to the E.S.E., and we stood to the N.E. till the 4th, when the wind fixed itself in

the N.E. quarter, and we accordingly stood to the N.W., with fine and moderate weather.

"In this situation land was seen bearing E.N.E., distant 8 leagues, immediately in the wind's eye, which prevented us from approaching it. Our latitude at noon was  $24^{\circ} 44'$  N., and longitude, deduced from our last lunar observations,  $145^{\circ} 41'$  E. of Greenwich. We regretted very much that we were not able to approach this land, as we knew of none in this part of the Northern Pacific Ocean. As we were steering to the N.W., we soon entirely lost sight of it.

"On the 5th the wind shifted to the S.E., which enabled us to steer to the N.E., when at 2 o'clock in the afternoon we thought land was visible to the E.S.E.; but the weather was so extremely hazy that it could not be ascertained whether it was land or a fog-bank. At three, however, land was seen in the north-east right ahead, but the weather continued to be so thick and foggy that the direction in which it extended could not be discerned. At half-past four we were abreast of it, at the distance of 5 or 6 miles, when it appeared to be an island, but of no great extent. It now rained very hard, and the atmosphere remained so hazy that our observations of the land were rather imperfect. It, however, appeared to be one of those barren isles so frequently found in these seas. Its length might be 15 or 16 miles from north to south; the shore seemed to be inaccessible to boats, from a great surf beating against the rocks, which terminated abruptly in the sea. The interior parts of the country appeared to be high, and a few solitary trees were very sparingly scattered on their declivities. We sailed along the shores of this island till six o'clock, when another island opened to our view, which was separated from the former by a channel of 3 or 4 leagues. It now blew very strong, with rain, and so thick a fog that we could see no distance ahead.

"Though the gale was favourable, yet, from the appearance of the weather, it was thought prudent to shorten sail, and remain under such as would enable us to haul to the wind on either tack. The utmost vigilance and attention were employed to guard as much as possible against any danger, and we sailed, as usual, all night with the courses hauled up in the brails. These isles, of which we could not discern the number, were named *Grampus isles*, from seeing a large grampus spouting up water close to the shore, which is a very uncommon sight in those seas.

"The night of the 5th was very tempestuous, with constant rain; but to console us for these inconveniences, we had a fair gale, with which we made great way to the N.E.

"On the 6th the wind shifted to the N.W., which brought us clear weather, and blew a steady gale. At noon the latitude was  $27^{\circ} 30'$  N., longitude  $148^{\circ} 37'$  E. At this time the variation of the compass was  $3^{\circ} 20'$  E.

"Our progress to the north now became very rapid, and we experienced a very sudden transition from heat to cold. Having just left a climate where the heats had been intense and oppressive, it was very natural the active operations of cold should be very sensibly felt by the whole crew. This circumstance, however, enabled us to reduce the allowance of water from a gallon to five pints per man, without any inconvenience whatever arising from such an alteration.

"The favourable gale at north-west continued till the 8th at noon. The latitude then was  $28^{\circ} 58'$  N., longitude  $154^{\circ} 19'$  E. Our principal object was to get to

the north as fast as possible, in order to benefit by the strong westerly winds, as well as to run down our longitude in a high latitude. This north-west gale continued to us the sharp piercing cold which has been already mentioned.

"The next day (9th) we passed by a considerable quantity of rock-weed, which we imagined to be but lately broken off, and for several days we had seen great numbers of birds. We were now considerably to the northward of the several small islands scattered either within or about the tropic, in the northern Pacific Ocean. We could not therefore form any probable conjecture from whence this weed came, and whither the birds retired at night, as they regularly left us about sunset, and took their flight to the east.

"About nine o'clock in the morning a sail was descried from the mast-head, and in about half an hour a large ship was seen from the deck. She appeared to be under an extraordinary crowd of sail, and exhibited a very singular figure, for not one of us, even with the assistance of glasses, could make out which way she was standing. The sight of a ship in those seas was such an unusual circumstance, that for some time conjecture was at a loss concerning it. At length, however, it was determined to be a galleon, bound to China from New Spain, and by some casualty driven thus far to the northward; though the track of those ships to Manila is generally between the parallels of  $13^{\circ}$  and  $14^{\circ}$  north latitude. In consequence of this opinion, several letters were written to inform our friends in China of our safety, and the progress we had made in the voyage. This extraordinary delusion, for it was no more, continued till we were within 2 leagues of the object; when, on viewing it with a glass, it was discovered to be a huge rock standing alone amid the waters. The first among us who became sensible of the deception remained silent, and diverted themselves with the strange conjectures and humorous observations of the sailors, one of whom was so certain of its being a ship that he was convinced he saw her colours. Its appearance did, indeed, very strongly resemble a first-rate man-of-war, under a crowd of sail; and such was its shape that, at a certain distance, it held forth to the eye the form of every particular sail belonging to a ship. As we ranged up with this rock, our surprise was proportionately augmented, and the sailors were more than disposed to believe that some supernatural power had suddenly transformed it into its present shape. It obtained the name of *Lot's Wife*, and is one of the most wonderful objects, taken in all its circumstances, which I ever beheld.



*Lot's Wife, bearing N., distant 2 miles. (Meares.)*

\* By noon we were abreast of it: when it bore E.N.E. 4 miles. The latitude was  $29^{\circ} 50' N.$ , longitude  $142^{\circ} 23' E.$  of Greenwich. The waves broke against its rugged

front with a fury proportioned to the immense distance they had to roll before they were interrupted by it. It rose almost perpendicular to the height, according to the tables, of near 350 feet. A small black rock appeared just above the water, at about 40 or 50 yards from its western edge. There was a cavern on its south-eastern side, into which the waters rolled with an awful and tremendous noise. In regarding this stupendous rock, which stood alone in an immense ocean, we could not but consider it as an object which had been able to resist one of those great convulsions of nature that change the very form of those parts of the globe which they are permitted to desolate.

"At noon of the 12th, our latitude was  $33^{\circ} 18' N.$ , longitude  $161^{\circ} E.$ , with a steady gale from the southward. We passed by a great quantity of rock-weed, and saw several large flocks of birds. In the evening a piece of timber, which appeared to be the rafter of a house, and a piece of a canoe, were seen floating upon the water, and soon after a spar, that appeared to have been newly cut. These were certain indications of land, and occasioned, if possible, an added exertion of vigilance, as this part of the Pacific Ocean is entirely unknown."

On the 13th and 14th a heavy gale was experienced, and on the latter day the *Felice* was in lat.  $36^{\circ} 20' N.$ , long.  $167^{\circ} E.$

II. The *abstract log* relating to the dates given in the Narrative just quoted furnish the following positions and remarks:—

1788, April 3rd, lat.  $24^{\circ} 56' N.$ , long.  $143^{\circ} 39' E.$ ; N.W. violent gales, with thunder, lightning, and rain, and a mountainous sea.

4th, lat.  $24^{\circ} 44' N.$ , long.  $145^{\circ} 41' E.$ ; N.E. strong breezes and clear; land seen E.N.E., distance 8 leagues.

5th, long.  $146^{\circ} 12' E.$ ; S.E. fresh breezes, some rain, thick, and hazy. Two small islands abreast, 5 or 6 miles; we named them the Grampus isles.

6th, lat.  $27^{\circ} 30' N.$ , long.  $148^{\circ} 37' E.$ ; N.W. strong breezes, a heavy rain, steady gales, and clear.

7th, lat.  $28^{\circ} 14' N.$ , long.  $151^{\circ} 56' E.$ ; W.N.W. strong gales, a heavy sea, weather clear, and very cold.

8th, lat.  $28^{\circ} 58' N.$ , long.  $154^{\circ} 19' E.$ ; N.W. fresh breezes and clear weather: and very cold.

9th, lat.  $29^{\circ} 50' N.$ , long.  $157^{\circ} 4' E.$ ; N.N.W. strong breezes and fair weather; saw a rock at E.N.E.  $\frac{1}{2}$  N. 1 league; we named it Lot's Wife. Rock-weed and flocks of birds seen.

10th, lat.  $30^{\circ} 5' N.$ , long.  $158^{\circ} 48' E.$ ; N.N.W. pleasant breezes and fine.

11th, lat.  $31^{\circ} 22' N.$ , long.  $159^{\circ} 36' E.$ ; variable, light breezes, cloudy, but pleasant.

12th, lat.  $33^{\circ} 18' N.$ ; South, fresh breezes and fine weather; rock-weed, flocks of birds, a piece of a canoe, and a piece of timber seen.

13th, S.S.E. a strong gale, gloomy and overcast, small rain and thick weather, and a great sea; saw rock-weed and a reddish spawn.

14th, lat.  $36^{\circ} 20' N.$ , long.  $167^{\circ} 0' E.$ ; N.W. hard gales and a heavy rain, and a very confused sea; passed more weed.

III. Finally, according to MEADES' chart the Grampus islands are placed in lat.

25½° N., long. 146° E.; and Lot's Wife in lat. 29° 50' N., long. 156° E.,—by D.R. carried forward from the 18th of March, when a lunar observation had been taken; and thus corresponding as regards date and position with both "Narrative" and "Log," in everything *except the Longitude given in the former*.

But how reconcile MEARES' position of Lot's Wife as given in the "Narrative," with the positions prior and subsequent to the discovery of the rock, and with its position in the "Log," and on the chart. This it must be confessed is inexplicable; it may be a misprint—a singular one no doubt—but still possible;\* but there is certainly no ground for supposing MEARES' position to be in error *fifteen degrees of longitude in twenty days' sail*, as Lieut. RODGERS infers (see p. 151), when he says that "Grampus islands are identical with Borodino islands," and consequently that Lot's Wife of MEARES corresponds with Lot's Wife in lat. 29° 42' N., long. 140° 20' E.;—the currents certainly in the part of the ocean traversed between March 18th and April 9th, would not cause such an error,—at first they would be westerly, and subsequently to the eastward.†

Most recent charts of the Pacific retain Grampus islands in the position given by MEARES, but not Lot's Wife as given in his "Log" and on his chart. This cannot be correct, for the latter unquestionably lies N.E.-ward of the Grampus islands, and Lot's Wife in long. 140½° E. is N.W.-ward of them. The alternative is to reject both, on Lieut. RODGERS' supposition,—or neither; it is impossible to accept the position of one as approximately correct, and not the other. It might eventually prove that the Grampus islands are identical with the Volcano islands (see p. 110), in which case, MEARES' Lot's Wife will also be more to the westward than his assigned position; but much stronger evidence than any yet offered must be furnished before it can be safe to erase the Grampus islands and Lot's Wife of MEARES.‡

The position of **Meares rock** (Lot's Wife), as given in his "Log" is lat. 29° 51½' N.; long. 157° 8' E. The name of Lot's Wife being already applied to a rock in a well-known position, it seems better to distinguish MEARES' discovery as **MEARES rock**.

The position of **Grampus islands** by MEARES' chart is lat. 25½° N., long. 146° E.; KRUSENSTERN places it in lat. 25° 40' N., long. 146° 40' E.; but as some whalers have reported islands in this vicinity, it may be as well to record them here;—a *group of islands* in lat. 26° 6' N., long. 146° E.; *three islands* in lat. 26° 6' N., long. 145° 4' E.; a *group of islands* in lat. 26° 6' N., long. 143° 44' E.; the *mean of all these positions* is lat. 25° 53' N., long. 145° 12' E.

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\* DOUGLAS, the companion of MEARES, must, on one occasion, have passed between Pona-fidin and Lot's Wife (in long. 140½° E.) when in command of the *Iphigenia*, but the regular continuity of MEARES' narrative precludes the possibility of any of DOUGLAS' manuscript being intermingled with MEARES'; moreover there is no mention by DOUGLAS, when in that position, of his seeing either island or rock.

† MEARES, in the *Felice*, when passing across his earlier track, bound from the Sandwich islands to China, found by obs. that he was six degrees *eastward* of his position by acc., thus, Nov. 20th, 1788, in lat. 21° N. his long. by acc. was 139° 18' E., by obs. 145° 53' E., after a run of twenty-five days.

‡ The fact of MEARES' Lot's Wife looking like a sail, is no proof of its identity with Lot's Wife in long. 140½° E.; in this work many other islands are described as being taken for a sail.

**Colunas**, on an old Spanish chart, is a *group of three islands*, in lat.  $29^{\circ}$  N., long.  $160^{\circ}$  E.; on another chart **Las Colunas**, consisting of two islands, are nearly in the position just given. They have been reproduced on recent charts in lat.  $29^{\circ}$  N., long.  $155^{\circ}$  E., but are otherwise unknown. The Spanish name, which signifies "column," naturally leads to the supposition that this may be identical with **MEARES' Lot's Wife**,—named Meares rock on p. 163.

**Guadalupe**, on old Spanish charts, is a *shoal* in lat.  $29^{\circ}$  N., long.  $149\frac{1}{2}^{\circ}$  E.; and in other instances two islets surrounded by a reef in lat.  $28\frac{3}{4}^{\circ}$  N., long.  $149\frac{1}{2}^{\circ}$  E.;—nothing is known of either.

**BYERS island**, was discovered by MORRELL in 1825, and placed by him in lat.  $28^{\circ} 32'$  N., long.  $177^{\circ} 4'$  E.; it is described as moderately elevated, about 4 miles in circumference, with good anchorage on the W.S.W. side, in 15 fathoms, sand and coral; the only danger is on the S.E. side, where a coral reef stretches 2 miles to the southward. The island is of volcanic origin, and has some under-wood and some smaller vegetation on it; it is the resort of sea-fowl, sea-elephants, and green turtle, and fine fish abound in the vicinity. Fresh water may be obtained on the S.W. side of the island.

**Patrocinio island**, discovered in 1799, by Capt. Don ZIFIANI of the *Senora del Pilar*, was placed in lat.  $28^{\circ} 9'$  N., long.  $175^{\circ} 48'$  E. It is described as 3 miles long, N.N.E. and S.S.W. The position was passed over by U.S. surveying vessel *Peacock*,—consequently it may possibly be identical with Byers island.\*

**Malabrigo or Margaret islands**, with a shoal extending some distance southward, are found on old Spanish charts in lat.  $27\frac{1}{2}^{\circ}$  N., long.  $149\frac{1}{2}^{\circ}$  E., and are supposed to have been discovered by BERNARDO DE TORRES in 1543. They may be the *group of three islands* seen in 1773 by MAGEE, and placed by him in lat.  $27^{\circ} 20'$  N., long.  $145^{\circ} 45'$  E.; they have also been reported by a whaler in lat.  $27^{\circ} 30'$  N., long.  $145^{\circ} 40'$  E.

*South Rowan island*—a whaler's report—in lat.  $27^{\circ} 4'$  N., long.  $139^{\circ} 50'$  E., is probably Rosario island, which is one degree more to the east; nothing is known in the position given.

A reef—whaler's report—in lat.  $26^{\circ} 5'$  N., long.  $160^{\circ} 5'$  E., is otherwise unknown.

**Laysan Rys or Lasker reef**, placed on charts in lat.  $26^{\circ} 5'$  N., long.  $173^{\circ} 25'$  E., was supposed to indicate an error in the original report, and to refer to Lisiansky reef which is in *west* longitude (*see* p. 58); but the following whalers' reports, viz. (a) **New island and rock** in lat.  $26^{\circ} 24'$  N., long.  $170^{\circ} 54'$  E., (b) **Bassieous island** in lat.  $26^{\circ} 6'$  N., long.  $173^{\circ} 27'$  E., and (c) **Laskan reef** in lat.  $25^{\circ} 50'$  N., long.  $173^{\circ} 50'$  E., seem to point to the existence of some danger in the locality, the mean position of which, rejecting the long. of (a), is lat.  $26^{\circ} 6'$  N., long.  $173^{\circ} 34'$  E.

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\* Mollusca abound in this region, and consequently it is regular whaling ground. On the 20th May 1840, in lat.  $26^{\circ}$  N., long.  $168^{\circ}$  E., the *Peacock* fell in with great quantities of *Jan-thina*; on the 21st, in lat.  $28^{\circ} 54'$  N., long.  $177^{\circ}$  E., the *Anatifa* were met with; they continued in vast quantities as far as lat.  $35^{\circ}$  N., and were seen as far east as long.  $164^{\circ}$  W. Some of the patches were miles in extent, trending S.E. by E. and N.W. by W.

**Sebastian Lopez**, on old Spanish charts, in lat.  $25^{\circ}$  or  $25\frac{1}{4}^{\circ}$  N., long.  $158^{\circ}$  E., is marked as a tolerably large island surrounded by a reef; **RAPER** makes it identical with the Grampus islands of **MEARES**. It is generally misnamed Sebastian Lobos island. On recent charts of the Pacific it is placed in long.  $154^{\circ}$  E.

An *island*—a whaler's report—placed in lat.  $26^{\circ} 6'$  N., long.  $154^{\circ} 36'$  E., is not otherwise known.

A *reef*—a whaler's report—in lat.  $25^{\circ} 30'$  N., long.  $152\frac{1}{4}^{\circ} 40'$  E., is otherwise unknown.

*Tree island*, placed on charts in lat.  $26^{\circ}$  N., long.  $145^{\circ} 40'$  E., is unknown, and may be a misprint for the group of three islands before mentioned (*see* p. 164).

**Arzobispo island**, nearly midway between the Volcano and Bonin islands, in lat.  $25^{\circ} 50'$  N., long.  $141^{\circ}$  E., is most probably one of the latter group (*see* p. 112).

**Fortana** or **Fortuna island**, discovered by the Spanish galleon *San Juan* in 1543, was reported to lie 30 leagues E.  $\frac{1}{4}$  N. of the Volcano islands, and is placed in lat.  $25^{\circ} 35'$  N., long.  $143^{\circ}$  E.; nothing is known of it; it may possibly be one of the Volcano group, as it has not been seen since.

**Dolares island**, of old Spanish charts, is in about the same position as that assigned to Kendrick island (*see* p. 123).

*Rosa island*, a whaler's report, in lat.  $24^{\circ} 25'$  N., long.  $138^{\circ} 56'$  E., is otherwise unknown, and is improbable in the position given.

**WEEKS island**.—Islands have frequently been reported near the parallel of  $14^{\circ}$  N. and the meridian of  $154^{\circ}$  E., but nothing definite was known of any of them until Capt. **GELETT** of the missionary packet *Morning Star*, in 1864, saw an island which by his observations he placed in lat.  $24^{\circ} 4'$  N., long.  $154^{\circ} 2'$  E., or about 800 miles N.N.E. from Guajan. "On the evening of Dec. 16th numerous land birds were seen, which increased in number the next morning, and it was remarked that land must be near, which was seen at 3h. p.m. on the 17th. The island is about 5 miles long, densely covered with trees and shrubbery, with a white sandy beach, and a knoll near the centre rising about 200 feet above the sea. The brig passed within 3 or 4 miles of it about sunset, and breakers were seen all around it. There were no signs of inhabitants on it. A reef extends to the north of the island. The position of this fertile island is important and reliable. It ought to be visited by some war vessel, and fully explored, as it lies directly in the track of whalers bound from Ascension in the Carolines to the sea of Okhotsk and the Arctic ocean."

Captain **KITTON**, of the *David Hoadley*, "in May, 1868, at 5h. p.m., being in the vicinity of an island named 'Marcus' on the chart, made an island, the west end of which (by a set of sights) was found to be in lat.  $24^{\circ} 24'$  N., long.  $153^{\circ} 58'$  E.; it appeared to be a low, level, sandy island covered with trees and bushes, about 2 or 3 miles long, east and west; no breakers were visible extending any great distance from either end; its width was not ascertained." This appears to be the island described by Captain **GELETT**.

The following have been reported in this vicinity, and are probably identical with it:—(1) *Weeks island*, a whaler's report, in lat.  $24^{\circ} 40' N.$ , long.  $155^{\circ}$ ; (2) an *island*, whaler's report, in lat.  $24^{\circ} 16' N.$  long.  $155^{\circ} 7' E.$ ; (3) *Marcus island*, a whaler's report, in lat.  $24^{\circ} 18' N.$ , long.  $153^{\circ} 42' E.$ ; (4) an *island*, whaler's report, in lat.  $24^{\circ} N.$ , long.  $153^{\circ} 40' E.$ ; (5) an *island*, whaler's report, in lat.  $24^{\circ} 5' N.$ , long.  $154^{\circ} 10' E.$

The *probable position* of Weeks island is about lat.  $24^{\circ} 10' N.$ , long.  $153^{\circ} 56' E.$

A *reef*, in lat.  $23^{\circ} 50' N.$ , long.  $164^{\circ} E.$ ; *Deik island* in lat.  $23^{\circ} 42' N.$ , long.  $163^{\circ} 14' E.$ ; *Decker* or *Darker island* in lat.  $23^{\circ} 24' N.$ , long.  $163^{\circ} 5' E.$ ; and an *island* in lat.  $23^{\circ} 3' N.$ , long.  $162^{\circ} 57' E.$ ;—all whaler's reports—are not otherwise known.

*Mears island*, in lat.  $23^{\circ} 50' N.$ , long.  $147^{\circ} E.$ : and *Congress island*, in lat.  $23^{\circ} 30' N.$ , long.  $148^{\circ} E.$ ,—are whaler's reports—and are not otherwise known.

**Desierta and La Mira islands.**—On old Spanish charts—that taken from the galleons by Anson in 1743, and another furnished to LA PÉROUSE at Monterey in 1786—are to be found two islands *in duplicate*—viz. Desierta (*i.e.* deserted, uninhabited, solitary), in about lat.  $23\frac{1}{2}^{\circ} N.$ , long.  $165\frac{1}{2}^{\circ} E.$ , and again in lat.  $20\frac{1}{2}^{\circ} N.$ , long.  $169\frac{1}{2}^{\circ} E.$ ; and La Mira (look out, take care) in lat.  $21\frac{1}{2}^{\circ} N.$ , long.  $164\frac{1}{2}^{\circ} E.$ , and again in lat.  $20\frac{1}{2}^{\circ} N.$ , long.  $168\frac{1}{2}^{\circ} E.$  LA PÉROUSE sailed over the latter positions assigned to these islands—*i.e.* between lat.  $20^{\circ}$  and  $21^{\circ}$ , without seeing either—or even the appearance and signs of not far distant land. However, the islands are reproduced on all recent charts as follows,—Desierta in lat.  $23\frac{1}{4}^{\circ} N.$ , long.  $161^{\circ} E.$ , and again in lat.  $20\frac{1}{4}^{\circ} N.$ , long.  $165\frac{1}{2}^{\circ} E.$ ; Camira (on all charts, and a misspelling of La Mira) in lat.  $21\frac{1}{2}^{\circ} N.$ , long.  $160^{\circ} E.$ ; and La Mira in lat.  $20\frac{1}{4}^{\circ} N.$ , long.  $164\frac{1}{4}^{\circ} E.$

Now, looking at the relative position, on the old Spanish charts, of the southernmost La Mira and Desierta from Gaspar Rico—viz., N.W. by N. distant 360 miles; and the relative position of Wake island and Gaspar Rico on recent charts, N.N.W.  $\frac{1}{4}$  W. distant 300 miles—all in the same part of the ocean—the impression that La Mira and Desierta represent Wake island (p. 169) is irresistible, and may therefore be regarded as the same.

**Otra and Volcano islands.**—These are two islands found on old Spanish charts.—Otra island in lat.  $23\frac{1}{4}^{\circ} N.$ , long.  $161^{\circ} E.$ , but on more recent charts in lat.  $23^{\circ} N.$ , long.  $156\frac{1}{2}^{\circ} E.$ ; and Volcano island in lat.  $22\frac{3}{4}^{\circ} N.$ , long.  $164^{\circ} E.$ , but reproduced on recent charts in lat.  $22\frac{1}{2}^{\circ} N.$ , long.  $160^{\circ} E.$  Nothing is known of them beyond being thus indicated in the positions given above.

*Massachusetts island*, in lat.  $22^{\circ} 28' N.$ , long.  $177^{\circ} 5' E.$ , or long.  $167^{\circ} 5' E.$ —a whaler's report—is otherwise unknown; a typographical error in the two reports shows a difference of ten degrees of longitude,—the first appeared in the *China Mail*.

An *island*, whaler's report, in lat.  $22^{\circ} 20' N.$ , long.  $145^{\circ} 45' E.$ , is otherwise unknown.

A *reef* in lat.  $22^{\circ} 7' N.$ , long.  $142^{\circ} 24' E.$  and another *reef* in lat.  $22^{\circ} 5' N.$ ,

long.  $142^{\circ} 30'$  E., whalers' reports,—probably refer to the same danger, the *mean position* being lat.  $22^{\circ} 6'$  N., long.  $142^{\circ} 27'$  E. Some charts have reefs in the same long., but one in lat.  $22^{\circ} 20'$ , and the other lat.  $22^{\circ} 50'$  E.

*Burrows island*, reported in the *China Mail*, in lat.  $22^{\circ}$  N., long.  $168^{\circ} 27'$  E., is otherwise unknown; it may be identical with Massachusetts island, referred to on p. 166.

**LOS JARDINES** or **MARSHALL islands**.—Some islands seen by ALVARO DE SAAVEDRA, in 1529, received the name of Los Buenos Jardines; and it is supposed they were again seen by VILLALOBOS in 1543; in old Spanish charts they are placed in lat.  $21^{\circ}$  to  $22^{\circ}$  N., long.  $153^{\circ}$  E. LA PEROUSE (1786) passed near this position and reported that he saw nothing of them; but Capt. MARSHALL, of the *Scarborough*, in 1788, returning from Botany bay to Macao, saw two islands in lat.  $21^{\circ} 40'$  N., long.  $151^{\circ} 35'$  E.; some whalers affirm that they have landed on these rocks, others assert they have sailed over the position; nothing is known of them beyond the most vague rumour.

A whaler's report places a *Marshall island* in lat.  $20^{\circ} 50'$  N., long.  $151^{\circ} 40'$  E.

**EUPHROSYNÉ reef and rock**.—In 1851, the *Euphrosyne* reported a rock, "looking like a ship under sail," in lat.  $21^{\circ} 42'$  N., long.  $140^{\circ} 55'$  E.; and the *Linda* announced a rock in lat.  $21^{\circ} 45'$  N., long.  $140^{\circ} 45'$  E. The same rock was also seen at a later date by Capt. BARRAS of the *Mary Ann*, who described it as "looking like a sail," in lat.  $21^{\circ} 42'$  N., long.  $140^{\circ} 53'$  E.

The *mean position* is lat.  $21^{\circ} 43'$  N., long.  $140^{\circ} 51'$  E.

Old Spanish charts show two rocks named respectively *Vela* and *Parece Vela*, N.E. and S.W. of each other, and near the meridian of  $140^{\circ}$  E.; they may be different positions for the same rock, and thus represent Euphrosyne rock; or the one may represent Euphrosyne rock and the other Douglas reef (*see below*).

A reef, in lat.  $21^{\circ} 40'$  N., long.  $133^{\circ} 25'$  E., a whaler's report, is otherwise unknown.

**Paul, Farce** or **Three islands**—whalers' reports—in about lat.  $20^{\circ} 25'$  N., long.  $141^{\circ} 30'$  E.—may possibly refer to Euphrosyne rock; nothing is known of them beyond the *reported position*.

*Valetta reef*, placed on charts in lat.  $21^{\circ}$  N., long.  $142^{\circ} 55'$  E., is otherwise unknown.

*Alcars* or *Meurs reef*, on charts in lat.  $21^{\circ}$  N., long.  $136^{\circ} 40'$  E., is probably identical with Douglas reef (*see below*).

A reef in lat.  $20^{\circ} 40'$  N., long.  $155^{\circ}$  E.; a reef in lat.  $20\frac{1}{2}^{\circ}$  N., long.  $153^{\circ} 10'$  E.; a reef in lat.  $20\frac{1}{2}^{\circ}$  N., long.  $152^{\circ} 50'$  E.; a sandy bank in lat.  $20^{\circ} 30'$  N., long.  $152^{\circ} 30'$  E.; and an island in lat.  $20^{\circ} 20'$  N., long.  $155^{\circ} 24'$  E.—all whalers' reports—may possibly indicate some danger near the *mean position* lat.  $20^{\circ} 30'$  N., long.  $153^{\circ} 47'$  E.

**DOUGLAS reef**.—This lagoon islet was discovered by DOUGLAS of the *Iphigenia* in 1789 on his voyage from the Sandwich islands to China. His brief remarks are—

"Sept. 15th at half-past ten saw a reef of rocks under our lee, extending about 5 miles in a W.N.W. and E.S.E. direction; they lie in lat.  $20^{\circ} 37' N.$ , long.  $136^{\circ} 10' E.$  and are extremely dangerous."

They were seen by BISHOP of the *Nautilus* in 1796, and described as rocks in lat.  $20^{\circ} 15' N.$ , long.  $136^{\circ} 54' E.$

The next observations are by Capt. B. SPROULE of the *Maria*, who says—"at noon, on March 18th, 1847, I was in lat.  $20^{\circ} 23' N.$ , long.  $136^{\circ} 14' E.$ ; stood on N.W. with a light wind, and at 2 P.M. the look-out aloft saw breakers and a rock above water, on the lee bow; kept away west to pass to leeward; when about 2 miles from the eastern extreme, I lowered a boat and went to examine the reef. I found it to consist of a narrow perpendicular wall of coral, enclosing an oblong lagoon of deep water. I rowed along its whole length, which I should say was 2 miles, by  $\frac{2}{3}$  of a mile wide at one-third from the eastern point. Sharp heads of pointed rock appeared frequently through the surf; and one isolated rock of about 12 feet high and 15 feet broad rose from the smooth water of the lagoon, near its western extreme, with the rock bearing E.N.E. I put the boat through a narrow channel in the reef of not more than 3 feet,—this was the only opening I saw, and had it not been very still under the lee, this would never have shown: high breakers were rolling over the northern and north-eastern parts. When the boat was on the wall I had 3 feet water; by packing two lengths, 17 fathoms; two lengths more no bottom with a whole line. The south side is nearly straight, in an E. by S.  $\frac{1}{2}$  S. and W. by N.  $\frac{1}{2}$  N. direction. The rock when seen from the ship, 3 miles off, appeared exactly like a boat's tanned lug. Its position is lat.  $20^{\circ} 31' N.$ , long.  $136^{\circ} 6' E.$  Nothing can be more dangerous than this reef, from its extent; its neighbourhood ought to be approached with the greatest caution in dark and blowing weather; and in the months of November, December, January and part of February, it blows very hard, with thick weather; but in fact, all the passage from the Sandwich islands to the coast of China requires the greatest caution. Innumerable sperm whale were playing about the reef, and the sea was perfectly alive with fish of many descriptions. Sharks were also very numerous." (*Naut. Mag.* 1848.)

Douglas reef was also seen by Capt. STEELE, of the *Sebastian Cabot*, in 1867; he describes it as "a reef extending in a W.N.W. and E.S.E. direction for 5 miles. There are two isolated rocks near its western end; the westernmost about 20 feet, and the other about 15 feet above water, distant from each other about a  $\frac{1}{4}$  of a mile. It is a very dangerous reef in stormy or cloudy weather, as it can be seen but a very short distance; the position of the westernmost rock is about lat.  $20^{\circ} 28' N.$ , long.  $136^{\circ} 17' E.$

Later still Capt. LUDWIG SAABYE, of the *Benjamin Howard*, writing to the *Mer. Mar. Mag.* in 1868, says—"I saw this reef on my passage from San Francisco to Hong Kong: on its west end is a rock about 4 feet above water; I saw it and the breakers, plainly, from the deck, distant about six miles. I consider it very dangerous. I made it in lat.  $20^{\circ} 25' N.$ , long.  $136^{\circ} 2' E.$  from good observations."

The mean of the positions, for the centre of Douglas reef, rejecting that given by BISHOP, is about lat.  $20^{\circ} 30' N.$ , long.  $136^{\circ} 9' E.$

**ABROJOS.**—An extensive shoal, under the name of Abrojos ("hidden rocks in

the sea"), is found on old Spanish charts in lat.  $22\frac{1}{2}^{\circ}$  N., long.  $133^{\circ}$  E.;—on recent charts it is inserted in lat.  $22^{\circ}$  N., long.  $129^{\circ} 10'$  E., and another named *Abajos* in lat.  $20^{\circ} 10'$  N., long.  $130^{\circ} 20'$  E.—*Capper island*, a whaler's report, was stated to be in lat.  $20^{\circ} 6'$  N., long.  $131^{\circ} 54'$  E. WILKES says that he passed over the position of both Capper island and the Abajos shoal of ARROWSMITH, in broad daylight.

More recently Capt. AKIN of the *Winthrop*, March, 1858, reports "a shoal or reef 1 mile long in a N.E. and S.W. direction, lat.  $20^{\circ} 37'$  N., long.  $132^{\circ} 2'$  E. ( $\approx 131^{\circ} 2'$  E.),—water smooth, and but few breakers to be seen, as the weather was fine:" this is 30 miles to the northward of where WILKES sought for Capper island and the Abajos shoal,—also, owing to a misprint in various authorities, the longitude is doubtful to the extent of one degree.

**Maurelle, Morrel or San Francisco islands**, two in number, are generally placed on charts in lat.  $19^{\circ} 20'$  N., long.  $179^{\circ} 25'$  E. with a query; an island has also been reported under the second name in lat.  $19^{\circ} 5'$  N., long.  $179^{\circ} 5'$  E. Capt. SPROULE remarks—"There are two islands on the chart in  $18^{\circ} 17'$  N., and respectively in  $179^{\circ} 15'$  and  $178^{\circ} 12'$  E., called MAURELLE'S. I passed over the site of each between 4h. A.M. and noon, but saw nothing; yet from the number of birds I feel confident we were near land somewhere: all these places are so very low that even from the mast-head they are visible no distance." These islands are only known through vague report.

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**WAKE island**.—This is probably the island said to have been discovered in 1796 by the *Prince William Henry* and placed in lat.  $19^{\circ}$  N., long.  $166^{\circ} 40'$  E., and it is also found on the chart that accompanies LA PEROUSE'S voyages published in 1797; it has frequently been seen since that date, and the *Libelle* (Bremen bark) bound from Honolulu to Hong Kong was lost on it, in March, 1866.

The first definite notice of it was given by Capt. SPROULE of the *Maria* (*Naut. Mag.* 1848)—"At 5h. P.M. the look-out on the foretop gallant-yard saw low land on the starboard bow; I went aloft and saw from the topsail yard a very low island, apparently about 3 miles in length, and not more than 6 or 7 from us; it lay in an E.N.E. and W.S.W. direction, was covered with low bushes,—rather higher in the centre than at the ends; unfortunately it was dark before we approached it sufficiently near to make any further observations. It is a very dangerous spot, laying, as it does, immediately in the track of vessels from Peru, Central America, and the Sandwich islands, and in a part of the ocean where vessels are generally running fast before the wind. I am confident it would not be seen more than 5 miles off deck in the day, and in a dark night never in time to avoid it if right ahead."

Wake island was partially examined by WILKES in 1841, and the following description of it is given in the "Narrative of the U.S. Exploring Expedition:"—"It is a low coral island, of triangular form, and 8 feet above the surface. It has a large lagoon in the centre, well filled with fish of a variety of species—among these some fine mullet. There is no fresh water on the island, and neither *pandanus* nor coconut trees. It has upon it the shrubs which are usually found on the low islands of

the Pacific. The birds were quite tame, although they were not so numerous as we had before met with on uninhabited islands.

"The time of low water took place at one o'clock, and the moon entered its last quarter on the same day: the tide was setting along the shore of the island, with much strength, to the westward; the rise and fall was 3 feet. From appearances the island must be at times submerged, or the sea makes a complete breach over it; the appearance of the coral blocks and of all the vegetation leads to this conclusion, for they have a very decided inclination to the eastward, showing also that the violent winds or rush of water, when the island is covered, are from the westward. The reef around this island is very small in extent.

"The position of Wake island was found by observations of equal altitudes on shore to be in lat.  $19^{\circ} 10' 54''$  N., long.  $166^{\circ} 31\frac{1}{2}'$  E."

The *Libelle*, bound from San Francisco to Hong Kong, touching at Honolulu, with passengers and treasure, was cast away on the night of March 4th, 1866. "The passengers and crew remained on board during the night, the sea breaking fearfully over the wreck the while, and landed with difficulty through the breakers the following day. After an ineffectual search for water for three weeks and much privation, it became imperative to take to the boats and endeavour to reach the nearest habitable island. Several days were spent in finding a suitable and safe point for departure—the breakers encircling the island, which appeared to be some 20 miles in circumference." They finally started and reached Guajan (Marianas) in May, where all were well received by the governor.

The schooner despatched from the Marianas to procure the treasure left on the island by the *Libelle*, found it after two days' search, under the guidance of the master of the lost vessel: he had erected marks on the spot, but all had been thrown down and washed away by the sea. The schooner "anchored off the west side of the island in 21 fathoms, about 110 yards from the shore; outside that there was no bottom with 35 fathoms of line. It is a coral island about 9 miles in circumference, with very little vegetation on it. The sea in all directions around is very deep."

From the various descriptions, it can be well understood that being awash or nearly so in heavy gales, it has been sometimes reported as an island, sometimes as a reef; it is low, and steep to seaward; from 9 to 20 miles in circumference; the larger portion of it a lagoon; the vegetation is very scanty and there is no fresh water; a few birds and an abundance of fish are the only food to be found.

It has been reported both as an island and a reef by whalers and others, under various names, as Wake, Week, Halcyon, Helsing, Wilson, &c., and as before observed may be the La Mira and the Desierta of old Spanish charts.

*Position*:—That by WILKES has already been given;—Capt. SPROULE made it in lat.  $19^{\circ} 18' N.$ , long.  $166^{\circ} 42' E.$ ;—Halcyon island, whaler's report, lat.  $19^{\circ} 30' N.$ , long.  $166^{\circ} 55' E.$ ;—Halcyon reef, whaler's report, lat.  $19^{\circ} 30' N.$ , long.  $166^{\circ} 30' E.$ ;—an island, whaler's report, lat.  $19^{\circ} 31' N.$ , long.  $166^{\circ} 35' E.$ ;—Capt. WOOD, CARGILL, and ENGLISH (who visited the wreck of the *Libelle*) place the entrance to the lagoon boat passage in lat.  $19^{\circ} 19' N.$ , long.  $166^{\circ} 30' E.$ ;—Wilson island, whaler's report, lat.  $19^{\circ} 15' N.$ , long.  $166^{\circ} 45' E.$ ;—Wilson island, lat.  $19^{\circ} N.$ , long.  $166^{\circ} 45' E.$ ;—the *mean of these positions* is lat.  $19^{\circ} 19' N.$ , long.  $166^{\circ} 39' E.$

N.B.—Various other islands and reefs have been reported north, south, east,

and west of the position assigned to Wake island, as follow;—an *island*, whaler's report, lat.  $20^{\circ} 30' N.$ , long.  $166^{\circ} 45' E.$ ;—an *island*, whaler's report, lat.  $19^{\circ} N.$ , long.  $163^{\circ} 30' E.$ ;—an *island*, whaler's report, lat.  $19^{\circ} 31' N.$ , long.  $168^{\circ} 35' E.$ ;—*Halcyon island*, lat.  $19^{\circ} 30' N.$ , long.  $163^{\circ} 30' E.$ ;—*Halcyon reef*, lat.  $19^{\circ} 16' N.$ , long.  $165^{\circ} 42' E.$ ;—*Halverd island*, lat.  $19^{\circ} N.$ , long.  $165^{\circ} 30' E.$ ;—and *Helsion island*, lat.  $17^{\circ} 21' N.$ , long.  $166^{\circ} 55' E.$  Very probably these refer to the same island—viz., Wake island; as combining the positions with those before given, the mean will be lat.  $19^{\circ} 15' N.$ , long.  $166^{\circ} 14\frac{1}{2}' E.$

The vicinity of most of these reported islands and reefs was examined by the United States Exploring Expedition, as well as by the Missionary ship *Morning Star*, and others; the only island reported is Wake island, in the description of which all agree.

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*Wake reef*, on charts in lat.  $17^{\circ} 50' N.$ , long.  $173^{\circ} 45' E.$ , an extensive shoal stretching N.E. and S.W., with a *small reef or islet*, 40 miles to the northward of it, seems like a repetition of Wake island and Halcyon reef to which reference has already been made;—the position here given being erroneous.

*Folger island* is a whaler's report in lat.  $18^{\circ} 21' N.$ , long.  $155^{\circ} 19' E.$ ; its position was passed over by WILKES.

**LINDSAY island** was seen by the British schooner *Amelia*, Dec. 25th, 1848. Capt. LINDSAY says,—“during a calm I discovered an island or rock in lat.  $19^{\circ} 20' N.$ , long.  $141^{\circ} 15\frac{1}{2}' E.$ ; it appeared about 40 feet high, and 4 miles in length, very barren, and of a dark brown colour.” Two days previously he had passed through the Marianas.

**FLORENCE shoal**.—Capt. WADSWORTH of the *Florence*, reports as follows:—April 13th, 1862, in lat.  $18^{\circ} 6' N.$ , long.  $143^{\circ} 18' E.$ , we passed over a shoal 2 miles in extent; got a cast of the lead in 10 fathoms, coral, but were off the bank before we could sound again; previous to sounding we passed over some places much shoaler—probably not more than 5 or 6 fathoms.

**CLARE or ANSON shoal**.—Charts show a shoal named Anson in lat.  $17^{\circ} 35' N.$ , long.  $124^{\circ} 50' E.$ , but the authority either for name or position is very doubtful. Apparently, however, there is danger not far distant, for Capt. AGEE of the *Earl of Clare*, in March, 1848, “being in lat.  $17^{\circ} 50' N.$ , long.  $124^{\circ} 40' E.$ , saw shoal water alongside; bottom distinctly visible 20 yards from the ship,—large white shells and dark-coloured rocks: immediately under the ship the bottom could not be seen, and the water was not discoloured.”

**San Francisco Xavier shoal**.—The Galleon chart of ANSON shows a large shoal in lat.  $17\frac{3}{4}^{\circ} N.$ , long.  $133^{\circ} E.$ ; other old Spanish charts show it in lat.  $16\frac{3}{4}^{\circ} N.$ , long.  $134\frac{1}{2}^{\circ} E.$ ,—naming it San Francisco Xavier. Rectifying the position,—it would be in lat.  $17\frac{1}{4}^{\circ} N.$ , long.  $131\frac{1}{2}^{\circ} E.$  It is very probable that this is the shoal which has for some time received the name of ANSON (*see above*),—though that navigator

does not record any such danger on his voyage from the Marianas to the vicinity of the Philippines.

Two reefs—whaler's reports—have been recorded in this vicinity,—one in lat.  $17^{\circ} 40'$  N., long.  $129^{\circ}$  E.,—the other in lat.  $16^{\circ} 45'$  N., long.  $129^{\circ}$  E. Thus there may be a shoal near lat.  $17^{\circ}$  N., long.  $130^{\circ}$  E.

A reef in lat.  $17^{\circ} 6'$  (or  $17\frac{1}{4}^{\circ}$ ) N., long.  $159^{\circ} 14'$  E.; also a reef in lat.  $17^{\circ} 5'$  N., long.  $156^{\circ} 15'$  E.—newspaper reports—are otherwise unknown.

*Tarquin island*, in lat.  $17^{\circ}$  N., long.  $160^{\circ}$  E., is unknown.

*New island*—a whaler's report—in lat.  $17^{\circ}$  N., long.  $136^{\circ}$  E. is otherwise unknown.

On old Spanish charts a shoal is marked in lat.  $16\frac{1}{2}^{\circ}$  N., long.  $143\frac{1}{2}^{\circ}$  E.; another named *Mira-por-vos* is in lat.  $14\frac{1}{2}^{\circ}$  N., long.  $143\frac{1}{2}^{\circ}$  E.; and a group of islands, the *Garbanzos*, in lat.  $13\frac{1}{2}^{\circ}$  N., long.  $143^{\circ}$  E.

These have been reproduced on recent charts as follow,—a reef in  $16^{\circ} 5'$  N.,  $139^{\circ} 5'$  E.;—a group of islands in  $13^{\circ} 15'$  N.,  $138^{\circ} 35'$  E.;—a shoal or reef in  $15^{\circ} 20'$  N.,  $141^{\circ} 5'$  E.;—*Spanish islands* in  $13^{\circ} 55'$  N.,  $142^{\circ}$  E.;—*Anson island* in  $13^{\circ}$  N.,  $141\frac{1}{2}^{\circ}$  E.

Comparing the position of the Marianas as represented on old Spanish charts with more recent determinations, it would appear that the old positions are about 2 to  $2\frac{1}{2}$  degrees of longitude in error. Instead of two shoals there may be but one; and both shoal and group of islands must be sought for 2 degrees to the westward of the Spanish positions.

A whaler's report places a reef in lat.  $16^{\circ} 32'$  N., long.  $143^{\circ} 22'$  E.

An island—whaler's report—in lat.  $16^{\circ} 55'$  N., long.  $176^{\circ} 50'$  E., is otherwise unknown.

*Cornwallis island* in lat.  $16^{\circ} 51'$  N., long.  $169^{\circ} 33'$  E. is a misprint;—for long. E. read long. W.; the site was examined by WILKES.

A reef is reported by a whaler in lat.  $16^{\circ} 36'$  N., long.  $169^{\circ} 42'$  E.; this may also be a misprint (as above); the position was examined by WILKES.

An island—whaler's report—in lat.  $16^{\circ}$  N., long.  $179^{\circ}$  E., is otherwise unknown.

An island in lat.  $16^{\circ}$  N., long.  $171^{\circ}$  E., or in lat.  $16^{\circ}$  N., long.  $171^{\circ} 42'$  E.—both whalers' reports—is improbable. WILKES examined the position, and 40 miles to the westward, by daylight, but nothing indicating a proximity to land was seen.

**SAN BARTOLOME.**—An island to which this name was given is found on old Spanish charts in about lat.  $14\frac{1}{2}^{\circ}$  N., long.  $163^{\circ}$  E., and also in long.  $161\frac{1}{2}^{\circ}$  E. on some charts. It was discovered by Torito Alonzo do Salazar, in 1536, and placed on Espinosa's chart in lat.  $15^{\circ} 10'$  N., long.  $163^{\circ} 43'$  E. Some whalers' reports place an island in lat.  $15^{\circ} 25'$  N., long.  $164^{\circ}$  E., and also in lat.  $15^{\circ} 11'$  N., long.  $163^{\circ} 25'$  E.; but the missionary ship *Morning Star*, and Capt. PALMER of the *Kingfisher* is said to have sailed over the latter positions; still, there is scarcely a doubt that the island named San Bartolomé by the Spaniards exists somewhere to the westward of Gaspar

Rico, and looking at the relative position of the two on the old charts, and that Gaspar Rico was placed about  $1\frac{1}{2}$  degrees eastward of its true position, San Bartolomé may probably be found something to the westward of any of the positions given above.

*Bartholomew island*, to the eastward of Gaspar Rico, in lat.  $14^{\circ} 40' N.$ , long.  $174^{\circ} 20' E.$  appears to be a repetition of San Bartolomé island, and is otherwise unknown.

*Gaspar island*—whalers' reports—in lat.  $15^{\circ} N.$ , and in the following longitudes, viz.,  $176^{\circ} 26' W.$ ,  $179^{\circ} 18' E.$ ,  $178^{\circ} 30' E.$ , and  $176^{\circ} 18' E.$ , is otherwise unknown. WILKES passed over all the localities assigned the island between long.  $175^{\circ} W.$  and  $174^{\circ} 20' E.$ , and saw nothing to indicate the proximity of land.

*Cornwallis island*.—The authority on which a group of this name is placed in lat.  $14^{\circ} 42' N.$ , long.  $171^{\circ} 5' E.$  is unknown; it undoubtedly relates to Gaspar Rico.

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**GASPAR RICO.**—A group of islands of this name is found on all old Spanish charts in lat.  $15\frac{1}{4}^{\circ} N.$ , long.  $170\frac{1}{4}^{\circ} E.$ , but the date at which it was discovered is unknown. The Nassau fleet (Dutch) in 1625 passed near a low island, which was taken for Gaspar Rico; and in 1796 DON FERNANDO QUINTANA, of the Spanish ship *Maria*, passed a group of five islands, on a rocky coral bank.

The first authentic account of Gaspar Rico is from Capt. JOHNSTON, H.M. ship *Cornwallis*, who, in 1807, passed to the northward of a group of islets and rocks extending 17 miles N.N.W. and S.S.E., the centre of which he placed in lat.  $14^{\circ} 30' N.$ , long.  $168^{\circ} 42\frac{1}{4}' E.$ ; the entire group he called **Smyth islands**, and named them singly—the largest *Sybillia*, the southernmost *Petrel*, and the others *Fruitful*, *Danger*, and *Rabbit*; the northernmost part of the rocky reef he named the *rocks of Scylla*;—and so Krusenstern describes them.

The next account is from Kotzebue: on March 18th, 1817, he thought the islands could not be far distant, from the number of sea birds around the ship; the next morning the sailor at the topmast head gave the news that he saw land. At 8 A.M. "we distinctly saw several islands overgrown with low bushes, visible only 5 to 6 miles, and they may, therefore, become more dangerous to the navigator than the groups (Marshall islands) lately discovered by us, which are at least covered with high trees, and give timely warning of every danger. At noon we had sailed round the southern point of the little group, and were under the lee of it, in very calm water, from whence we could clearly overlook it. A coral reef here also forms a circle, the eastern side of which consists of nothing but small islands. We found the extent to be  $13\frac{1}{2}$  miles. We approached under the lee of the reef within a couple of hundred fathoms. I sent the lieutenant with a boat to examine whether we could penetrate into the lagoon; his endeavours were fruitless; the group had no opening. To judge from the light colour of the water, the depth in the basin cannot be considerable, and probably the whole group will soon become one island. . . . It forms a low sickle-shaped group of inconsiderable circumference, the convex side of which is turned to leeward. Only on the windward side mould has collected on the reef. It rises mostly naked out of the waves under the lee, and at its entrance sinks into the inner sea. The islands form a very close row; the vegetation appears poor;

and the cocoa-nut tree is nowhere seen to rise above the rest. The desert appearance of this group, and the number of sea birds and frigate birds which swarmed round us near it, and which darted at the red streamer of our ship, as at prey, convinced us that they were really uninhabited." From the chart that accompanies Kotzebue's voyage, the centre of the reef is in lat.  $14^{\circ} 39' N.$ , long.  $169^{\circ} 2' E.$

Lieut. BROOKE, of the U.S. schooner *Fenimore Cooper*, examined the western side of Gaspar Rico in 1859; heavy weather prevented a thorough survey of the reef. The side consists of a coral wall with some clumps of rock scattered here and there. At the northern extremity there are some clumps of rocks partly above water and partly awash, and to the southward a couple of sand banks a few feet above the water, apparently separated from the northern rocks by a channel, the whole encircled by breakers which do not run out very far, and have a boat entrance into the lagoon. The group extends about 9 miles N.N.W. and S.S.E.; the eastern extent was not ascertained. The reef to the westward is very low and very bold,—nearly steep-to; at the distance of a mile from the breakers, bottom was just reached at 1000 fathoms. There appear to be some detached breakers about a mile N.W.-ward of the N.W. extremity. Lieut. BROOKE made the position of the main clump of rocks at the N.W. end in lat.  $14^{\circ} 41' N.$ , long.  $168^{\circ} 56\frac{1}{4}' E.$ \*—with which the position given by KOTZEBUE closely approximates.

Gaspar Rico has at various times been reported as Cornwallis, Smyth, Sybilla, Petrel, and Farnham island.

A group of small islands reported by Capt. KIMBALL in lat.  $14^{\circ} 25' N.$ , long.  $149^{\circ} 10' E.$ , is without any other authority, and seems unlikely in that position.

An island—whaler's report—in lat.  $13^{\circ} 9' N.$ , long.  $168^{\circ} 24' E.$ , is otherwise unknown.

A shoal—whaler's report—in lat.  $12^{\circ} 53' N.$ , long.  $162^{\circ} 30' E.$ , is described as follows in *Mer. Mur. Mag.* for 1866, p. 92:—"We found there a white coral shoal, with columns of red coral, the water varying from 12 to 21 fathoms where we sounded; we lowered a boat and sounded until we lost the lead. The shoal extends east and west, and is about 3 miles; its length we cannot tell, but it appeared to shoal more as it tended eastward."

An island—whaler's report—in lat.  $10^{\circ} 16' N.$ , long.  $172^{\circ} 55' E.$ , is otherwise unknown.

An island—a whaler's report—in lat.  $10^{\circ} N.$ , long.  $180^{\circ}$ , is otherwise unknown.

A reef—whaler's report—in lat.  $10^{\circ} N.$ , long.  $179^{\circ} 30' E.$ , is otherwise unknown.

A reef—whaler's report—in lat.  $10^{\circ} N.$ , long.  $179^{\circ} 15' E.$ , is otherwise unknown.

\* This is the position given on the chart issued by the U.S. Hydrographic Office in August, 1867; in the "List of the Reported Dangers to Navigation in the Pacific Ocean," published by the U.S. Hydrographic Office in 1866, the longitude is given as  $168^{\circ} 48\frac{1}{4}' E.$ , but the reason why is not stated; see the note on pp. 53-54.

## PALAU, PALAO, OR PELEW ISLANDS.

These islands, under the name of Palaos, are, in the "Anuario estadístico de España," included in the Spanish "Ultramar" province of the Islas Carolinas, but the Spaniards have no settlement there. They were probably discovered by VILLALOBOS in 1543, and appear to have been noted on the old Spanish charts, but in such a manner as not to distinguish them from members of the Carolines,—to which indeed they belong as regards race, productions, and formation.

The Pelew islands first came into notoriety through the shipwreck there of the E.I. Co.'s *Antelope*, Capt. H. WILSON, in 1783. On the occurrence of the disaster the captain and crew were received with the greatest kindness by the natives; and the king, ABBA THULLE, not only supplied all their wants, but furnished them the means of building a small vessel to proceed to China. After remaining three months on the island of Orulong they embarked, taking with them the king's second son, Prince LEE BOO, who unfortunately died of small-pox shortly after his arrival in England. It is to be regretted that Capt. WILSON, who furnished the materials for "An Account of the Pelew Islands," has not recorded a single observation that would be of any service to the navigator.

In 1790 the E.I. Co. despatched Capt. MCCLURE to reward the natives by taking them rich presents of foreign manufactures, of animals, and seeds of valuable fruits; he returned twice afterwards and remained several months. Heretofore the people had been described as amiable, friendly, and hospitable to strangers; of late years all has changed, and they have gone from bad to worse by their contact with the traders and whalers that have touched there; of some ships' crews cast on shore on some of the islands since 1820, such as could not effect an escape, are said to have died of starvation and cruelty; this however we believe is not the case with Korrör island, where, as late as 1856, a shipwrecked crew were well received.

**PALAU** or **PALAO** is the native name of this group of islands, on the authority of Dr. GULICK, the Polynesian missionary. It consists of a chain of islands of various sizes, situated on a coral reef not less than 100 miles in length and about 35 miles wide where broadest. The principal islands were populous at the time of the wreck of the *Antelope*, and Dr. GULICK estimates that there are about 3000 people on them now. They are of middle height and of a dark copper colour. Their hair is long and flowing. The men go nearly naked, and the women wear small aprons or fringes made of the fibre of the cocoa-nut. Both sexes are tattooed, and their teeth are blackened from infancy. They manufacture pottery of a coarse kind, also knives of mother-o'-pearl, and beautiful dishes, bracelets, and spoons of tortoise-shell. Their canoes are made out of the trunks of trees; many of them are beautifully carved and inlaid with shells, and large enough to carry thirty men. Their arms are pikes, javelins, and slings.

The group is of moderate height, and, with one exception, the islands are small, many being mere islets. Viewed from sea they appear well wooded, and the largest island is in many places mountainous, with here and there extensive and beautiful valleys. The soil is rich and fertile; grass is abundant, but as there are no cattle

to eat it down it grows high, is scorched, and then burnt up by the heat of the sun. Yams and cocoa-nuts, being the chief articles of subsistence, are tended with the utmost care; they have also the bread-fruit, plantains, oranges, lemons, and other fruits. The sugar cane is made into a preserve. Fish is abundant, and fowls are numerous in the woods in a wild state. There are no rivers on the islands,—the supplies of fresh water being from brooks and ponds, of which there are many; the chief source at Orulong for the *Antelope's* party was the well at the back of the island, which gave sufficient for daily use and enough to water the vessel for the voyage to China, by collecting it daily in casks.

The **great reef** on which the islands are situated extends from the southernmost point of Pillilau—the last island but one to the southward—about 38 miles in a northerly direction, nearly as far as a conspicuous hill on Babelthuap island, in about lat.  $7^{\circ} 37' N.$ ; thence it bends off in a N.E.-ly direction towards the northernmost islets: this is the West side of the reef; it uncovers in many spots, and there are two or more channels navigable for very small vessels. On the east side of the islands the reef rarely extends more than 4 or 5 miles from the land, and frequently much less, especially in the vicinity of Pillilau and off the N.E. end of Babelthuap.

Besides the reef immediately connected with the islands, there is another **extensive reef** or **bank stretching far to the northward** of the Palau islands, and its connexion with which is unknown; on it in lat.  $8^{\circ} 16' N.$  are two **low sandy islets**. DOUGLAS of the *Iphigenia* (1788) passed across a part of this bank; he states that from Kyangle (the northernmost of the Palau islands) to the two sandy islets, a reef of rocks runs in a N.W. direction to the distance of 11 or 12 leagues, and extends 5 leagues to the north of the sand islets; at 1 p.m., with these bearing west of south 3 or 4 leagues, soundings in 8 fathoms water were obtained; "as the current set them to the westward they stood on, being apprehensive if they went on the other tack that they should risk being driven down on the reef, which was at this time on their lee beam; they therefore kept the lead going, and, as the water was clear to the bottom, people were ordered to the mast-head to give notice of any danger. \* \* \* Till 6 p.m. the soundings were from 8 to 20 fathoms, over large rocks. The lead was kept going every half-hour during the night, without finding any bottom. Thus the shoal extends northward as far as lat.  $8^{\circ} 45' N.$ , to the eastward in long.  $135^{\circ} E.$ , and to the westward as far as the eye could reach from the mast-head." The sandy islets, which DOUGLAS calls **Good Lookout islands**, he places in lat.  $8^{\circ} 13' N.$ , long.  $134^{\circ} 44' E.$ \* (approximately).

**KYANGLE islets.**—The northernmost of the Palau group consist of four small low islets surrounded by a reef: the largest islet, named **Kyangle**, is about 4 miles in circumference, and its **position** is about lat.  $8^{\circ} 8\frac{1}{2}' N.$ , long.  $134^{\circ} 50' E.$

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\* The longitudes in this extract from DOUGLAS are corrected to the presumed position of the N.E. point of Babelthuap being  $134^{\circ} 55' E.$  according to Capt. ERSKINE. DOUGLAS made Kyangle island (which he calls Moore island) in lat.  $8^{\circ} 6' N.$ , long.  $134^{\circ} 6' E.$ ; Good Lookout islands in lat.  $8^{\circ} 13' N.$ , long.  $133^{\circ} 58' E.$ ; and the great shoal to stretch northward as far as lat.  $8^{\circ} 45' N.$ ,—eastward to long.  $134^{\circ} 13' E.$  DOUGLAS at the time of his passing the group was unaware of the loss of the *Antelope*.

The other small islets or rocks are named respectively Arayonet, Karapellas, and Korack.

**KOSSOL**, to the southward of Kyangle, is a dry sandbank stretching N.E. and S.W. about 7 miles. In the channel separating them irregular depths of from 10 to 50 fathoms have been found, on a bottom of sand and coral, but it may be full of banks and rocky heads. Rocks awash, with high breakers, exist about 6 miles west of the south end of Kossol.

Southward of Kossol, between it and Babelthuap, are soundings of 10 to 20 fathoms on sand and coral, but the bottom is very irregular. DOUGLAS, unable to approach the S.E. side of the Palau islands, "stood to the northward in order to get round a reef of rock and examine the N.W. side of Babelthuap; but on advancing towards it, reef appeared within reef, and from the mast-head a range of rocks was seen extending northward and westward as far as the eye could reach."

**BABELTHUAP**, or *Baabelthuap*, the largest island of the group, is 25 miles long, N.N.E. and S.S.W. On its western side is the high hill from the summit of which Lieut. MCCLURE saw both extremes of the chain of islands. It is divided into several districts, but the names and positions are somewhat uncertain. There are three small islets (in line) off the north end, as also a small group off its S.E. end. Point Artingal, the easternmost point Babelthuap and of the Palau chain, is in about lat.  $7^{\circ} 41' N.$ , long.  $134^{\circ} 55' E.$  according to Capt. ERSKINE.

**KORROR**, near the south end of Babelthuap, has numerous villages on it, and was the residence of king Abba Thulle. Close to it, off the south and west sides, are several small islands, named respectively *Amalakel*, *Assakysut*, and *Emunga*.

**URUKTHAPAL** is the most considerable island to the southward of Korror, and off its westernmost point, distant 2 miles, is *Orulong*, where the crew of the *Antelope* resided.

There are several openings and channels in the reef in the vicinity of Korror and Urukthapel. "Fronting the high, bluff east point of Urukthapel there is a large opening, with anchorage and soundings, in about  $7^{\circ} 16' N.$ , having a small channel to the N.W., with 7 to 8 fathoms, through the middle of the reef inside, betwixt that island and Korror. When within the opening of the outer reef another branch of the channel stretches along the east side of Korror, to N.E., where is good shelter inside the reef; and this channel leads round the east and north sides of Korror to the western point of the island, with soundings in it from 10 to 25 fathoms." (HORSBURGH.) The anchorage within the reef, which is 10 miles eastward of the east point of Korror, is called *New Harbour*; there are rocky heads in it, but there are depths of 16 to 10 fathoms towards the S.W. end of the harbour.\*

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\* Captain A. CHYNN furnishes the following remarks on these channels:—"A long, narrow, rocky island lies close to the south side of Korror; and three others near its west point. The south-easternmost of the three is Malackan; it has a tolerably high peak, by which it can be distinguished when outside the reef. Between the rocky island above mentioned and the N.E. part of Urukthapel is a good harbour. The entrance to it is through a narrow opening in the reef, or coral flat which extends from Urukthapel to the south angle of the rocky island. The

MCCLUKE's first anchorage was off Orulong island, he subsequently passed along the S.E. side of Urukthapel, and proceeded into Irakong harbour.

**IRAKONG** island, which is rocky and wooded, is immediately southward of Urukthapel, its centre being in about lat.  $7^{\circ} 11\frac{1}{2}'$  N. The reef fronting it to the eastward and S.E. affords good shelter—between it and the island; this is known as **Irakong harbour**. The opening in the reef is in about lat.  $7^{\circ} 13'$  N., or southward of the one previously noted; the soundings at the entrance are from 10 to 7 fathoms, deepening inside.

Another opening in the reef, in about lat.  $7^{\circ} 8'$  N., leads to a channel with 8, 9, and 10 fathoms water, close round the north side of the first small island (**Akomokam**) to the southward of Irakong.

**PILILAU** island, 8 miles to the S.W.-ward of Irakong, is 9 miles long N.E. and S.W. It is low, fertile, wooded, and inhabited. The part of the reef which is immediately northward and N.W.-ward of this island is nearly dry at low water, and on it are numerous small islands or islets in various directions, bearing between N.E. and N.W. from the N.E. extremities of Pililau. Its S.W. point is in about lat.  $6^{\circ} 57\frac{3}{4}'$  N., long.  $134^{\circ} 21\frac{1}{2}'$  E.; and it is here, as before said, that the great reef commences.

*Tides.*—The tides flow east and west, and are regular among the Palau islands, unless affected by the winds; rise 6 or 7 feet at F. and C.

**ANGAUR**, the southernmost island of the Palau group, is the only one not situated on the great reef. A channel, 5 miles wide, separates it from Pililau; it is safe, but there are no soundings, both islands being steep-to. Angaur stretches N.E.

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depth of water in the channel is from 10 to 5 fathoms. A coral patch lies within the passage; and one or two others in the outer part of the harbour. The best anchorage is close to the east side of Malackan, in 15 fathoms, where there is a small run of excellent fresh water.

To the eastward of the bluff east point of Urukthapel, and fronting the passage to the above harbour, is a space nearly 5 miles in length N.E. and S.W., where there is no reef, but merely a bank of soundings, extending about 3 miles from the shore, on which there is good anchorage. A ship may anchor in 13 fathoms with the following bearings, where she will have plenty of room to get under weigh with any wind,—Malackan peak N.N.W.  $\frac{1}{2}$  W., the passage through the reef leading to Malackan harbour N.W.  $\frac{1}{2}$  N.,—and the east extreme of Babelthuap (or islands which lie near it) N.E.  $\frac{1}{2}$  E. Inshore of this the water deepens to 20 fathoms. This anchorage is in about lat.  $7^{\circ} 16\frac{1}{2}'$  N.

The channel between the south end of Babelthuap and Korror is  $1\frac{1}{2}$  miles wide, and is navigable from the sea round the east and north sides of Korror, to the king's village, near its west point, with a depth of from 10 to 25 fathoms in it; but on account of there being a reef, which is 10 miles in length, N.E. and S.W., to the eastward of Korror, fronting the entrance, and several coral patches within this reef, it is too intricate a passage for a stranger to attempt. The anchorage inside this large reef is called New Harbour; but Malackan harbour is the best, and the only one which should be resorted to by trading vessels."

The island of Korror, although small, is the most important of the group, being the seat of government. Captain CHERRY says the inhabitants are hospitable to foreigners, and especially to the English; that the king claims sovereignty over the whole group, but it is only by force of arms that he can maintain his supremacy; and that vessels trading there should not dispose of firearms to any but the Korror people.

and S.W., being broader at the north end than towards the south. The S.W. extremity is in about lat.  $6^{\circ} 53\frac{1}{2}'$  N., long.  $134^{\circ} 16\frac{1}{2}'$  E.—HORSBURGH, from the mean of eleven ships' observations, places it  $4\frac{1}{2}'$  more to the east.

*Reef or shoal*.—McCLURE found a bank with 10 fathoms water on it, half a league west of the S.W. point; subsequently, in the *Mangles*, he found a reef extending  $\frac{1}{2}$  a mile from this low sandy point. HORSBURGH did not see anything of it; but in April, 1855, Capt. M'CLELLAN of the *Chrysolite*, passing the south end of Angaur, at about 2 miles, saw breakers and a few black rocks  $\frac{1}{4}$  of a mile off the south point, also a reef distinctly seen for a good  $\frac{1}{2}$  mile farther.

Some navigators state and are firmly convinced that these islands are from 15' to 20' more to the westward than the positions here given, but that is not probable; their position may not be accurately determined, but the error is not very great. The charts of this part are very indifferent, and scarcely trustworthy,—in fact, mere sketches.

RAPER places the E. point of Babelthuap 12', and the S. point of Angaur 8', more to the westward than the positions here assigned.

Babelthuap, in the Palau language, signifies "Upper sea," and the people of that division as well as the country, go by that appellation. Korrer, and its dependencies to the southward, are termed Arreketheo.

*Keil island*.—Under this name a small island has recently been inserted on charts, in lat.  $7^{\circ} 15'$  N., long.  $134^{\circ} 5'$  E.,—or 15 miles westward of the great reef of Palau;—the west side of Palau has been the usual route of vessels for half a century, its existence, therefore, in that position is somewhat doubtful.

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#### ISLANDS, ROCKS, AND SHOALS, WEST OF THE PALAU ISLANDS,—

BETWEEN THEM AND THE INDIAN ARCHIPELAGO;—

FROM LAT.  $10^{\circ}$  N., TO THE EQUATOR.

**SEQUERIA islands or Los Martires**.—These islands were discovered in 1527 by DIEGO DE ROCHA, and subsequently seen by LAFITA in 1802. They were described as a group of two low, flat islands near each other, with a third island (named Catritan) more to the southward. They have never been reported since the latter date, and nothing further is known of them.

The position assigned them is lat.  $8^{\circ} 45'$  N., long.  $131^{\circ} 25'$  E.

*Johannes island*, placed in lat.  $6^{\circ} 50'$  N., long.  $132^{\circ} 28'$  E., is stated to have been seen by two vessels.

**HUNTER or Haycock island**.—A high island, in lat.  $5^{\circ} 33'$  N., was reported by Capt. HUNTER to lie 12 leagues eastward of the Tulus islands; and in 1813 the E.I. Co.'s ship *Volunteer*, when passing the Meangis islands, saw (to the northward) a high rock or isle like a haycock; whether the two reports refer to the same island is, from the data, uncertain. But Capt. PEDERSON, of the *Cordelia Beran*, bound from Singapore to Helen reef (*see* p. 181) in September, 1858, passed close to what he considered Haycock island, in about lat.  $5^{\circ} 35'$  N., long.  $127^{\circ} 37'$  E. It is de-

scribed as having a hill on its eastern end, which at a few miles' distance somewhat resembles a haycock. The western part of the island is low. A great number of palm trees, or trees resembling the palm, with a bare straight trunk and bushy top, were growing on it.

The latter position coincides (within 5 miles) with Capt. HUNTER's position—*eastward* of the Tulus islands, consequently, though it may not be absolutely correct, it is probably not far in error,—being perhaps 4' or 5' more to the westward. But great caution is required when navigating to the northward of the Meangis islands—between them and Mindanao island—for not only is the number of islands unknown, but the positions are in the same predicament.

**SANSOROL** (or **St. Andrew**) islands, discovered by PADILLA in 1710, are two in number, and said to be connected and surrounded by a reef which is steep-to, and extends but a short distance from either island. Kodo-kopuei, the southernmost and largest, is from 1 to 2 miles S.S.W. from Sansorol, the northernmost of the two. They are small, low, flat and thickly wooded; and may be seen about 12 or 14 miles off. There are about 200 inhabitants on the islands, and these occasionally visit the Palau in their canoes.

The *position* (centre) is about lat.  $5^{\circ} 20' N.$ , long.  $132^{\circ} 16' E.$

**ANA** (**Pulo Anna** or **Current**) island was discovered by an English vessel in 1761. It lies S.  $16^{\circ}$  W. distant  $10\frac{1}{2}$  leagues from Sansorol island, and is about  $\frac{1}{2}$  a mile in extent. It is low, thickly wooded, and contains about 100 inhabitants. A reef is said to project a mile from its north, west, and south sides. It is visible 12 miles.

*Position*.—About lat.  $4^{\circ} 38' N.$ , long.  $132^{\circ} 3' E.$

**MERIR** (**Pulo Merir** or **Warren Hastings**) island was discovered by the Spaniards in 1761. It lies S.  $52^{\circ}$  E. distant 10 leagues from Ana island, and is about  $1\frac{1}{2}$  to 2 miles long (N. and S.), and nearly a mile wide. The central and southern parts are higher than the north end; it is nevertheless generally low, but well covered with cocoa-nut trees, especially towards the northern part, and visible from 12 to 14 miles. The inhabitants number about 100, and in their canoes frequently visit passing vessels, but they have nothing to barter.

It has been generally supposed that there is no danger near the island; but Capt. McCLELLAN (July, 1855), "passing to leeward of it, saw a reef stretching a considerable distance from both ends; and a rock a good mile off its N.N.E. side, showing in the hollow of the sea as a round black lump." It may be, however, that he mistook Anna island for Merir.

*Position*.—Centre about lat.  $4^{\circ} 20' N.$ , long.  $132^{\circ} 28\frac{1}{2}' E.$

**TOBI** (**Lord North** or **Neville**) island, about  $1\frac{1}{2}$  miles long, E.S.E. and W.N.W., is thickly wooded, and estimated to contain 200 inhabitants. It has a reef projecting off its east extremity, but is otherwise safe to approach. It may be seen 12 miles off.

The natives, in canoes carrying six or eight men, sometimes attempt to visit passing ships, but the master of the *Cordelia Beran* (1858) says, "small vessels or

those indifferently armed should be careful, for the natives are bold and not to be trusted." The remarkable "tree in the centre of the island," and which HORSBURGH describes as "the first thing visible," no longer exists.

*Position*.—Capt. SETON of the E.I. Co. ship *Helen* made it in lat.  $3^{\circ} 2\frac{1}{4}'$  N., long.  $131^{\circ} 4\frac{1}{2}'$  E.; more recent observations place it in about lat.  $3^{\circ} 1'$  N., long.  $131^{\circ} 7'$  E.

A reef, W. by N.  $\frac{1}{2}$  N., 54 miles from Tobì, and in lat.  $3^{\circ} 18'$  N., long.  $130^{\circ} 12'$  E., is only known through *vague* report.

**HELEN reef and islets.**—If this is not the same danger announced by CARTERET of H.M.S. *Swallow* in 1767, it was discovered by Capt. SETON of the E.I. Co. ship *Helen* in 1794, who describes it as "a very dangerous shoal lying W.N.W. and E.S.E., about 6 miles; the east end appeared a dry sand, but on the west part there were rocks a very little above water: no ground with 100 fathoms of line  $3\frac{1}{2}$  miles due south of a very conspicuous part of it. I am inclined to think that the reef stretches a good way to the northward, as I saw from the masthead the appearance of breakers running from the west end to the N.E.-ward. From the centre of the reef, to which I gave the name of *Helen shoal*, Lord North island bears N.  $75^{\circ}$  W., 40 miles."

Capt. HANSON, of the Swedish ship *Wasa*, saw it in 1804, and thought it a new discovery. By his description a high sandbank faced the sea, with breakers.

In 1843 Capt. WHITTINGHAM of the *Helen Stewart* passed the spot, and says, "there are two trees, making like a sail, on the small islet on the north extreme of Helen shoal, which I made 8' W. from Pulo Anna. At noon, the two trees bore N.E.; a sand patch N.E. by E.  $\frac{1}{2}$  E.; another patch E.  $\frac{1}{2}$  N.; and a third, east,—also the S.W. extreme of the shoal E.S.E. 2 leagues distant. There was a ledge of low rocks along the edge of the shoal; and the water perfectly smooth inside."

Capt. LEGONIDEC describes an island—probably the dry bank—4 miles from the northern extremity of Helen reef, as mentioned by HORSBURGH.

The latest information on the subject is that given by Capt. PEDERSON of the *Corodelia Beran*, who was sent from Singapore in 1858 to endeavour to recover cargo from the wreck of the *Lady Raglan*, which had been lost on Helen reef. The spot was made Oct. 4th, and two wrecks seen on it,—one near its south-western edge, and the other (the *Lady Raglan*) in a bight on its western edge. The latter vessel was loaded with tea, and everything was found as when left by the crew; two-thirds of her hull was on the reef, being kept there by the coral heads through her bottom, and the remaining portion was in deep water.

The reef is described as being above 16 miles long in a N.N.E. and S.S.W. direction, and 8 miles wide at its broadest part, which is near its southern end. Its interior is a basin of deep water, encircled by a narrow belt of dark heads of coral, against which the ocean swell dashes with great fury. In sailing round the reef no break was seen through its margin, or foul ground along it, except at its south-eastern point, where white or shallow water extended  $\frac{1}{2}$  a mile outside the breakers, and where there appeared to be a narrow opening into the interior. A rock, with 2 or 3 fathoms over it, was discovered lying west about a mile from the wreck of the *Lady Raglan*, and north about  $\frac{1}{2}$  of a mile from the extreme western part of the reef.

As no anchorage was found along the reef, the water being ocean deep close-to, the *Cordelia Beran* remained off it under sail from October 4th to November 11th, her boats bringing tea from the *Lady Raglan*. During this period the weather was generally unsettled, with heavy squalls from the W.N.W., then calms, which often placed the vessel in a critical position, the currents being strong and irregular, sometimes setting at the rate of 2 knots to the eastward (or towards the reef\*), and at other times as strong to the westward. The month of October was more favourable than November; in the former the wind was steadier from the S.W.-ward, and fewer calms; in the latter, there were calms and baffling winds, and the squalls were heavy and the current strong.

**Tides.**—The tides ran strong over the reef, the flood to the eastward, the ebb to the westward. The flood sometimes set with such force that the men could not keep their footing in one foot of water. The boats were enabled at times to get across the barrier at the S.S.E. part of the reef when the tide was high, but great care had to be taken to avoid the sharp heads of coral, having 10 to 20 fathoms water close to them.

**Caution.**—In light airs or in baffling winds a wide berth should be given to Helen reef, for the currents in its vicinity are variable and strong, and have occasioned the loss of many vessels on it, and others have but narrowly escaped being wrecked.

**Position.**—The N.N.E. extreme is in about lat.  $3^{\circ} 0' N.$ , long.  $131^{\circ} 52' E.$ ; the S.S.W. extreme in about lat.  $2^{\circ} 46' N.$ , long.  $131^{\circ} 42' E.$  RAFFE places the N. point in long.  $131^{\circ} 55' E.$

**Carteret reef**, as distinct from Helen reef, is still retained on charts, and placed (centre) in lat.  $2^{\circ} 55' N.$ , long.  $134^{\circ} 10' E.$ , on what authority the writer has not been able to discover: most navigators who have passed through this part of the Pacific deny its existence in the locality assigned it.

A reef, in lat.  $2^{\circ} 16' N.$ , long.  $130^{\circ} 10' E.$ , is indicated as a doubtful danger on the chart of the Molucca islands, by Lieut. GREGORY, Netherlands navy.

**ASIA ISLANDS**, first described by the E.I. Co. ship *Asia*, are three in number and low. The two southernmost are near each other; and the other (detached from them about 5 miles N.E. by N.) has a reef above water projecting from its N.E. extreme about  $1\frac{1}{2}$  miles eastward; the latter island is in about lat.  $1^{\circ} 4' N.$ , long.  $131^{\circ} 23' E.$ ; and the S.W. island in lat.  $1^{\circ} N.$ , long.  $131^{\circ} 20' E.$  The channel between these islands and the Aiou islands (to the southward) is 24 miles wide and clear of any known danger.

The **Aiou islands**, to the southward of Asia islands, are low and numerous; they are situated on an extensive reef the centre of which is in lat.  $0^{\circ} 30' N.$ , long.  $131^{\circ} 10' E.$

**ST. DAVID** or **FREEMILL islands**, the centre in about lat.  $0^{\circ} 55' N.$ , long.  $134^{\circ} 22' E.$ , are four in number and close together, with an islet or rock

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\* The *Cordelia Beran* lying-to on the west side of the reef, where the *Lady Raglan* was wrecked.

between the north and east islands. All are low and of coral formation, but being well covered with cocoa-nut trees are visible 18 to 20 miles. The reef which encircles the group projects about 1 mile from the north and south extremes, but not so far to the east and west; on the east side of the south island it does not extend more than a cable's length, and has no soundings close-to. The group is about 14 miles long, and the same in width—the reef being circular; it is well inhabited, and canoes generally come off to passing vessels.

## CAROLINE ARCHIPELAGO.

The **CAROLINE ISLANDS**—the *Islas Carolinas* of the Spaniards, and one of their "Ultramar" provinces—lie between lat.  $3\frac{1}{2}^{\circ}$  and  $10\frac{1}{4}^{\circ}$  N., and between long.  $137\frac{1}{4}^{\circ}$  and  $163\frac{1}{4}^{\circ}$  E., extending from west to east over a space of 1530 miles. By a rough estimate (and inclusive of the Palau islands) they have an area collectively of 877 square miles; and according to the missionary Dr. L. H. GULICK, contained 21,680 inhabitants in 1860, of which number about 18,080 appertain to the Carolines proper. Though nominally belonging to Spain, and, with the Marianas, forming part of the government of the Philippines, the Spaniards have no settlement on any of the islands.

Many of the principal members of the archipelago were discovered by the enterprising navigators, chiefly Spanish, of the 16th, 17th, and 18th centuries, but the erroneous position assigned to, and the loose description given of some of them by the discoverers, do not permit of their ready identification with any of the islands as they are now known.

The discovery made by the Portuguese commander DIEGO DE ROCHA, in 1526, was probably Sequeira islands. The *Ilas de los Reyes* of SAAVEDRA, seen in 1528, may be the Ulithi group; but this is not certain. In 1542 VILLALOBOS probably discovered the Palau islands; and in 1565 LEGASPI saw other islands of the archipelago. SIR FRANCIS DRAKE, in 1579, may have seen some islands south of Eap; and QUIROSA, in 1595, probably discovered Ponapi. The so-called Nassau fleet, in 1625, saw what are supposed to be Eap and Fais; and in 1686 LAZEANO discovered islands in this region the position of which is unknown, but he called them the *Islas Carolinas*, after the royal consort of Carlos II. of Spain; since that date this name has been adopted for the whole archipelago, though for a time there was an attempt made to call it the *Nuevas Filipinas* (New Philippines).

Knowledge of these islands grew upon the Spaniards of the Mariana and Philippine islands by means of the proas which drifted to them; and in 1696 FATHER PAUL CLAIN, of Guajan, wrote a short account of the Caroline islands, which is found in the fourteenth volume of the *Lettres Edifiantes*. In 1705, SERRANO, visiting Europe, presented a chart of the archipelago to Pope CLEMENT XI., who consequently wrote to the kings of France and Spain, urging that the natives might be Christianized.

In 1710, the Jesuit College at the Philippines sent out a vessel for this purpose. They first discovered a small coral island to the S.W. of Palau (Pelew), named Sansorol. Here Fathers DUBERRON and CORTEL, with fourteen lay missionaries, were

in such haste to plant a crucifix that they went on shore contrary to the captain's desire. The vessel was carried off by the current and did not return for more than a month, when nothing could be learned of these first Christian martyrs on the Caroline islands: twice the succeeding year were vessels sent in search of them; the first time the island could not be found; the second, the vessel was lost in a typhoon, and only two persons escaped.

In 1722, Father CANTOVA, of Guajan, wrote a letter describing several Caroline islanders that had been drifted to the Marianas during the year, and whom he had converted; accompanying the letter was a rough chart and a detail of all he could learn of the Caroline islands from his converts. This letter and chart were the best authorities regarding these islands until the voyages of LUTKE, FREYCINET, DUPERRÉ, and D'URVILLE, 1819-1838.

At last, in 1731, Fathers CANTOVA and WALTER accomplished their desires, and went on a mission to the Ulithi group. They remained there together three months, when WALTER returned to Guajan for assistance. Winds were adverse, and he did not reach Ulithi for more than a year, and when he did, he found that CANTOVA and all his attendants had been killed, from fear, it is said, on the part of the natives that their faith would be overturned. Doubtless the knowledge of what had been so ruthlessly accomplished on the Marianas affected the reception of whites on the Caroline islands.

Such in brief is the history of the discovery of these islands, and of the first missionary enterprises to convert the natives.

The **Caroline archipelago** consists of forty groups; thirty-five of these are of a low coralline formation, and contain from 300 to 400 islands and islets of various sizes; five are basaltic islands, with a large coral element about them. Many different dialects are spoken on the widely separated groups, though they are evidently dialects of the same mother tongue, the Malay, and are strongly allied to the language spoken in the Marshall and Gilbert islands.

The character of the natives on the different groups varies considerably, and will be described as occasion offers.

N.B. In describing each group, the first name given is that by which it is known to the natives of the Caroline islands, on the authority of Dr. L. H. GULICK; the spelling has been conformed to the system of LEPIUS, which has been adopted by the Micronesian mission.

The *positions* have been taken (principally) from the latest edition of the French chart, No. 1152, "Carte des Iles Carolines, etc., corrections essentielles en 1869."

*Elivi island*, placed on charts in lat.  $9^{\circ} 10' N.$ , long.  $137^{\circ} 14' E.$ , does not exist; it is the French position of one of the Ulithi group—longitude from Paris, not Greenwich.

*Feis*, or *Feys island*, placed on charts in lat.  $10^{\circ} 20' N.$ , long.  $143^{\circ} 40' E.$ , and *Farroilep islands*, in lat.  $10^{\circ} 35' N.$ , long.  $146^{\circ} 5' E.$ , do not exist in these positions. On CANTOVA's chart of the Caroline archipelago, where the islands are distributed very much at random, these two islands are placed north of the parallel of  $10^{\circ} N.$  Both are well known members of the group, but they lie south of  $10^{\circ} N.$ , and have been heedlessly reproduced by chart compilers (in duplicate) in both positions. *Feis*

and Farroilep in the positions here given were sought for by Lieutenant KNOX during WILKES' exploring expedition, and not found.

**NGOLI.**—This group was seen by VILLALOBOS in 1543; but it must have been discovered at an earlier date, since it is related that the natives came to him holding up a cross, and calling out "buenos dias, matelotas," from which the islands have been called the *Matelotas*. On LUTKE's chart it is the *Great West Lamo-Haur* group, but was not visited by him; on French charts, *Goulou*; and Admiral RAINIER, of H.M.S. *Suffolk* (1796) called it the *Spencer Keys*. On CANTOVA's chart it is called Ngoly; and on that of LUIS DE TORRES, Ngolog.

The islands or islets on and connected with the reef are small, low, and covered with trees. The two largest (which are 3 miles apart) are near the southern edge of the reef, and to the N.W.-ward of them, at the distance of 7 miles, is another conspicuous islet. The southernmost island seems safe to approach on the south side. The E.I. Co.'s ship *Duckingfield Hall*, with the wind at S.E., got close to the east side of these, in the night of January 22, 1798, and had soundings from 20 to 35 fathoms, coral rock. She made a few tacks before daylight, mostly in soundings of 20 to 30 fathoms, but could not clear the islands because the tide or current set strong westward. At 7h. A.M. it turned, and set eastward with strong rippings; shortly afterwards, when the southern island bore S. 10° W., the depth decreased to 11, next east to 5 fathoms; she then tacked to N.N.E. and immediately deepened; afterwards passed over two small patches of 5 fathoms, and finally rounded the southernmost island.

The two northernmost islets, which are very small, are 17 miles to the northward of the southern islands, and are a mile apart; they are very dangerous to approach in the night, owing to the reef which extends some distance to seaward beyond them in a northerly direction, some say to the distance of 6 miles; but the course of the *Astrolabe* (June, 1828) shows that it does not extend beyond 2½ miles. In a westerly direction, however, the reef extends much further, its outer edge being 16 miles S.W. by W. (*true*) from the northernmost islet, and the same distance N.W. by W. (*true*) from the southernmost island.

Captain CHEYNE says: "There is a passage on the N.W. side of the south island, leading to the lagoon, but the anchorage inside, if any, would be very unsafe. This is a most dangerous group, and should have a good berth in passing, particularly in hazy weather or dark nights, as the island cannot be seen above 10 or 11 miles in clear daylight, and strong currents often prevail in the vicinity."

The group contains about 100 inhabitants, who visit passing ships in their canoes, bringing cocoa-nuts, smoked fish, and cloth of their own manufacture.

*Position.*—S. island, lat. 8° 14½' N., long. 137° 40' E.;—N. point of reef, lat. 8° 34' N., long. 137° 39' E.;—W. point of reef, lat. 8° 25' N., long. 137° 27' E.; nothing is known of the extent of the reef to the eastward of a line joining the northernmost islet with the southernmost island.

**YAP or YAP.**—This island was seen by several of the old Spanish navigators, and probably by DRAKE; some suppose it to have been first seen by the so-called Nassau fleet in 1625. The old E.I. Co.'s vessels, when taking the *eastern passage* to China,

frequently reported it, and it is constantly seen by ships navigating between Australia and China. It is called *Guap* on French charts. CANTOVA names it Yap; and LUIS DE TORRES, Yapa.

Eap is one of the high islands of the Caroline group. (It seems, however, to be uncertain whether there are two islands or only one island connected with the fringing reef). Its main direction is N.N.E. and S.S.W., and its length (including the reef) 17 miles. The south extremity of the island is low, and it gradually rises into hills of some elevation towards the central and northern parts; these hills are of such a character (hummocky) that they give the appearance of two, three, or more contiguous islands when seen from a distance. The *Astrolabe*, passing close to its south end in 1828, made but one island, the same vessel in 1839 passing its north end, and along the west side, made two islands. The reef, which is a chain of black rocks mingled with coral, does not appear to extend beyond the island more than 2 or 3 miles in any part, but owing to the flatness of the land near the south end, the reef there is dangerous to approach during the night,—the distance from the higher land having caused the reef to be reported as 2 leagues from the S.W. extremity, and extending in a W.S.W. direction, where the black rocks appear level with or just above the water. The *Astrolabe* found the reef fringing the north, west, south, and south-eastern sides of the island,—in some places not extending a mile from the shore of the island, but more than twice that distance off the north and south ends. The island is green and beautiful in aspect, but not well wooded. It contains about 2000 inhabitants.

Capt. CHEYNE, who has collected *biche-de-mer* at Eap, says "the island is surrounded by a coral reef, which extends from its southern end 2 or 3 miles, and more in a W.S.W. direction from the S.W. point. It is possessed of an excellent harbour on the S.E. side, formed in an angle of the coast by the reefs. The entrance, which is through the reef, is about 200 yards wide, and can easily be made out from the mast-head when standing along the reef. When inside, the channel widens, and trends more to the northward. The anchorage at the head of the harbour, off the village of *Tomal*, is perfectly safe, the holding ground good, and the depth of water moderate.

"The south part of the island is low, but it rises into hills towards the centre, which is moderately elevated. It is visible 8 or 9 leagues, and makes in three hummocks, which would lead a stranger passing to mistake it for three islands. There is very little wood inland. The shore in many places is lined with mangroves, and the low lands between the villages are covered with small wood. The cocoa-nut tree is very abundant, particularly on the southern part. The villages are situated near the shore amongst groves of cocoa-nut, bread-fruit, and betel-nut trees. In consequence of the scarcity of large timber, the natives get their proas built at the Palau islands, which they frequently visit.

"The natives are an able-bodied race, well formed, and of a light copper complexion. They are more advanced in civilization than most of the other Caroline islanders, their villages being regularly laid out in streets, which are neatly paved. They have also well constructed stone wharves and piers. Each village has a large paved square, where the chiefs assemble for consultation. Their houses form an oblong, and

are well constructed. The roof is thatched with palm leaves, and the sides are covered in with wicker work.

"The canoes and proas of these natives are formed of planks sewed together. The bottom is formed like a wedge, and the keel being similar in shape to a crescent, they draw a good deal of water. Those in which they perform their voyages to the other islands are of a larger size, rigged with a triangular sail, and generally have a hut built amidships on a platform. They are very weatherly, and sail exceedingly fast in smooth water.

"Both sexes wear long hair, and tuck it up in the form of a knot, on one side of the head. The dress of the males, if such it may be called, is slovenly in the extreme. They wear a narrow breech cloth next them, and, by way of improvement, a bunch of bark fibres, dyed red, over it, the ends of which hang down to their knees before and behind. The females are decently clad: their dress consists of a petticoat, formed of long grass or banana fibres braided on a string, and made wide enough to meet when tied round the body; when dressed they wear several of these, one over the other, which form a bushy petticoat. These dresses are dyed of various colours, and are worn of different lengths, the dress of the unmarried girl hardly reaching to the knee, while that of the married woman hangs down to the ankle. They wear hats formed of palm leaves, similar in shape to those worn by the Chinese. Many of the men are neatly tattooed on the breast, arms, and shoulders, but it does not appear to be much practised amongst the women. The implements of warfare in use among these people are knives, spears, clubs, slings, and stones. The spears are made of hard wood, jagged at the points, and are in consequence very dangerous weapons.

"Their food consists of cocoa-nuts, of which they have an abundant supply, bread-fruit, bananas, *taro*, sugar-cane, fish, and turtle. At the north part of the island they catch the turtle when small, and feed them in a pond until they reach their full growth.

"The natives of Yap are cunning and treacherous, and would not hesitate to cut off a vessel, provided they had a favourable opportunity. They captured a Manila brig in Tomal harbour, about the year 1836, and murdered the whole of her crew, fifty in number, with the exception of one boy. There were only ten men on board when they made the attack, the remainder of the crew being distributed amongst the villages collecting *biche-de-mer*. The brig was dismantled and burnt. A Manila schooner was cut off about the same time at Mackenzie group, and the whole of her crew murdered; she was also burnt. The greatest caution therefore is necessary in holding intercourse with these people."

*Position*.—S. end of reef, lat.  $9^{\circ} 24' N.$ , long.  $138^{\circ} 10' E.$ ; N. end of reef, lat.  $9^{\circ} 38\frac{1}{2}' N.$ , long.  $138^{\circ} 18' E.$ ; centre of island, lat.  $9^{\circ} 31\frac{1}{2}' N.$ , long.  $138^{\circ} 15' E.$

**HUNTER** reef was discovered by Capt. HUNTER, in July 1791. At 4h. p.m. when Eap bore S. by W.  $\frac{1}{2}$  W. distant 8 leagues, rocks were seen under the bottom, and soundings were obtained in 15 fathoms. The rocks seemed very large, with patches of white sand between them. In twenty minutes the water had deepened to no bottom at 40 fathoms. It appeared to be a narrow coral ridge, without any very shoal water on it, as there was no break or rippling, and the swell was quite sufficient to produce a break on any dangerous spot. The lat. given is  $9^{\circ} 57\frac{1}{2}' N.$ , making the long. about  $138^{\circ} 10' E.$ ;—**RAPEE** makes it  $3'$  more easterly.

**ULITHI** or **ELIVL**.—This is a group consisting of two distinct reefs, on each of which are several islands and islets. It is supposed to have been discovered by the Spanish navigator EGUI in 1712; subsequently it became the site of the missionary labours of CANTOVA; it was visited and described by Capt. MACKENZIE in 1824, and hence called the **Mackenzie** group, and by LUTKE in 1828. CANTOVA calls it Egoi or Lumululutu, and LUIS DE TORRES, Mugmug.

The *western* reef, on which was situated the Spanish mission, and where CANTOVA was murdered, contains from 24 to 25 low islands and islets, the principal of which are **Mogmog** or Mogueumog (whence the reef is named), **Falalep**, **Trollem**, &c. There are small channels in the reef between some of the islands, and these lead to a lagoon, through one of which the U.S. schooner *Flying Fish* (WILKES' "Exploring Expedition") entered, with not less than 7 fathoms water on the bar.

The eastern reef has but few islands on it, the principal being **Elap** and **Ear**, and a shoal extends from it 12 to 15 miles to the S.E.-ward, on the outer edge of which LUTKE saw the bottom distinctly.

The two reefs are separated by a channel 8 miles wide, into which LUTKE entered as far as the middle.

The islands are well wooded, and contain about 200 inhabitants.

*Position*.—The group extends between lat.  $9^{\circ} 42'$  and  $10^{\circ} 7' N.$ , and between long.  $139^{\circ} 37'$  and  $140^{\circ} 3' E.$ ; the island near the S. end of the western reef (and within 2 miles of which the *Astrolabe* passed in 1828) is in lat.  $9^{\circ} 48' N.$ , long.  $139^{\circ} 43' E.$ ; the N.E. extremity of the western reef is in about lat.  $10^{\circ} 7' N.$ , long.  $139^{\circ} 48' E.$ , but  $7'$  more to the east according to WILKES.

**FAIS**.—This island, according to the chart of SERRANO, was discovered by the Nassau fleet in 1625. On CANTOVA's chart it is called Feis; and on that of LUIS DE TORRES, Fais; in both instances north of  $10^{\circ} N.$  It was seen in 1828 by LE GOARANT DE TROMELIN, and KRUSENSTERN on this account gave it the name of **Tromelin**; he estimated it at about 5 miles long by 2 miles wide; but LUTKE, who visited it in the same year, and calls it **Feys** island, says it is only  $2\frac{1}{2}$  miles in circumference, and differs from most of the Caroline groups, inasmuch as it is neither surrounded by a reef, nor has it a lagoon. The formation is madreporé rock, 30 feet high, against which the sea breaks. Being steep to there is no anchorage; but the surf is less on the south side than elsewhere, and the coast is there sandy. Landing is difficult everywhere, and the natives are not as good sailors as those of many of the other islands. Bread-fruit is scarce, but bananas are abundant. It contains about 300 inhabitants.

*Position*.—LUTKE made the E. point of the island in lat.  $9^{\circ} 46' N.$ , long.  $140^{\circ} 35\frac{1}{2}' E.$

**SOROL**, also called **Philip islands**, was seen by Captain HUNTER in 1791. It is probably the Zaraol of CANTOVA's chart; but is not mentioned by LUIS DE TORRES. There are two islands distant from each other 3 or 4 miles, but connected by a reef and partly (if not wholly) surrounded by it. The S.E.-ly island is the largest; but both are low and wooded, and contain about 20 inhabitants.

*Position*.—The centre of the S.E. island is in about lat.  $8^{\circ} 6' N.$ , long.  $140^{\circ} 51' E.$

**MAURIPUK** is said to have been seen by Capt. HUNTER in 1791, but this is uncertain; it was discovered at an earlier date, as it is on CANTOVA's chart as Eurrupuc, and on that of LUIS DE TORRES as Aurupig. LUTKE passed along its N.E. side, but had no communication with the natives. Capt. CHEYNE, who visited the group in 1844, calls it the **Xama** isles. It consists of two small, low coral islets, connected by a reef which forms a lagoon on the south side of the islets. This lagoon is of an oval shape, and its greatest diameter  $2\frac{1}{2}$  miles, E.S.E. and W.N.W. Both islets are wooded, but produce nothing but cocoa-nuts. There are about 50 inhabitants.

*Position.*—The easternmost islet is in about lat.  $6^{\circ} 40' N.$ , long.  $143^{\circ} 11' E.$

**WOLEA** or **ULEA**.—This group is noted on CANTOVA's chart as Ulee, on that of LUIS DE TORRES as Guliai or Ulea; and the number of islands was variously estimated from eleven to twenty-four. It may be the "Thirteen Islands" seen by Capt. WILSON of the *Duff* in 1793. LUTKE visited it in 1828, and his lieutenant made a thorough examination of it; he calls it **Uleai** or Ulea.

The group is  $5\frac{1}{2}$  miles long (east and west), nearly  $3\frac{1}{2}$  miles wide where broadest, i.e., towards its western part, and 15 miles in circumference. On a reef, which encloses a lagoon, are 22 islands and islets of various sizes; these are situated on the east, north, west, and S.W. sides of the lagoon, on the shores of which are the villages and huts of the natives.

LUTKE says that the outline of the group is very irregular; there are two salient angles towards the N.E. and N.W., with a deep indentation between them, so that the present group has the appearance of having been formed out of two originally independent groups: a channel into the lagoon, 13 yards wide, within the indentation and between the islands of **Algrail** and **Faralles**, seems the point of separation. The reef which extends thence towards the S.E. unites, off **Motogoru** islet, with that running from **Raur** island,—completing the eastern group, on a portion of the west side of which there is a depth of  $4\frac{1}{2}$  fathoms. The reef extending from **Falalls** island, first N.W., subsequently north, and then east toward **Faralles**, forms the western group.

The lagoon is open to the southward, and there are several channels leading into it.

**Wolea**, the north-easternmost and largest island, is of a triangular form, and gives its name to the entire group. The reef off its south or lagoon side is narrow and steep, so that landing is easy there; the bottom is even, clean and sandy, and quite perceptible through the transparent water at the depth of several fathoms. The surface of the island is pleasant and well wooded, with many clear spots and numerous native dwellings; the predominant tree is the bread-fruit.

**Raur**, the south-easternmost island, is long and narrow, and the reef extends rather more than  $\frac{1}{2}$  a mile to the S.W. of it. Here the natives have constructed several small artificial harbours, and a stone jetty running out 100 yards seawards. The island between Raur and Wolea is named **Falian**.

A mile to the west (northerly) of the south point of Raur is the small islet of **Motogoru**, which is surrounded by a reef, on each side of which is a channel leading to the anchorage inside of Raur and Wolea islands. The *Séniavina* (LUTKE'S

vessel) entered between Motogozu and Raur. Capt. CHEYNE, speaking of the *entrance and anchorage*, says, "the harbour is fit for large vessels, and the opening leading to it is wide; but there is only 5 fathoms on the bar or sunken barrier. The depth inside is from 8 to 10 fathoms."

**Falalis** is the southernmost island of the group; between it and Motogozu islet are several small detached coral patches, and one channel of from 5 to  $6\frac{1}{2}$  fathoms least water; there is also another with rather less water, nearer the reef on which Motogozu is situated. The reef of Falalis extends about  $\frac{1}{2}$  of a mile eastward of the east point of the island, and also  $\frac{3}{4}$  of a mile N.W.-ward from the N.W. point; between the N.W. extremity of Falalis reef and the next islet to the north (**Falulap**) there is another navigable opening (of 5 or 6 fathoms water) into the lagoon.

The west side of the group is a reef on which are nine small islets, from the northernmost of which it trends continuously N.E., east, and S.E. into the indentation before spoken of; on this part of the reef are the islands of **Ulemaraï** (the N.W. island of the group) and **Saliap**, with three small islets, the easternmost of which is **Faraïles**, already referred to as having a narrow opening into the lagoon close by it. **Tagaulap** is an island on the north side of the group, running east and west; it lies eastward of **Algrail**, and N.W. from Motogozu islet. N.E.-ward from Tagaulap, between it and Wolea island, is the island of **Mariaon**.

The reef between **Algrail** and Raur on the one side, and between **Faraïles** and **Falulap** on the other, is without a break or opening into the lagoon.

The group is well wooded, and produces cocoa-nuts, bread-fruit, *taro*, bananas, sugar-cane; fish is also plentiful. The inhabitants are a light copper-coloured race, numbering about 700 in all, and are the great navigators of the western part of the Caroline islands; it was from this island that the colony was established at Saipan in the Marianas (p. 86), and a regular trade is now established between the two places. Their language is slightly different from that spoken at Eap to the west, and at Truk (Hogoleu) to the east, with both which islands the Woleans have traffic. Their weapons are Spanish knives, spears, clubs, slings, and stones. The principal chief of the Wolea group used to reside on Ulemaraï.

*Position*.—The N. end of Raur island is in lat.  $7^{\circ} 21' 40''$  N., long.  $143^{\circ} 58'$  E.; Falalis island (centre) lat.  $7^{\circ} 19' 45''$  N., long.  $143^{\circ} 54'$  E.

**IFALIK** is mentioned by both CANTOVA and LUIS DE TORRES, and is the **Wilson** group (of two islands) seen by Capt. WILSON in 1793. LUTKE examined it in a casual way in 1828, and found it to consist of four islands or islets situated on the edge of a lagoon about 5 miles in circumference.\* Capt. CHEYNE says there is a boat passage leading to the lagoon, on the south side, between the two southern islets. LUTKE found the natives very bold and troublesome; they number about 200, which is considerable for so small a group of low coral islets. Cocoa-nut and bread-fruit trees are abundant.

*Position*.—According to the French chart, No. 1152, the centre of the group is in

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\* LUTKE calls the group Ifaluk,—and the four islets, Ifaluk, Moaf, Ella, and Fararik.

lat.  $7^{\circ} 14' N.$ , long.  $144^{\circ} 24' E.$ ; but LUTKE places the N.E. point of the group (the N. point of Ifalik islet) in lat.  $7^{\circ} 15\frac{1}{4}' N.$ , long.  $144^{\circ} 30' E.$

*Ifaluk* or *Wilson island*, placed on some charts in lat.  $7^{\circ} 15' N.$ , long.  $145^{\circ} 24' E.$ , is the Ifalik just described, but misplaced in position.

LUTKE says in his "Journal":—"April 2nd. Lat.  $7^{\circ} 11' N.$ , long.  $145^{\circ} 4' E.$ , found the ~~Ifaluk~~ group, which was seen in the morning, and communicated with the natives:—April 3rd. Lat.  $7^{\circ} 15' N.$ , long.  $144^{\circ} 29' E.$ " And his "Narrative" says,—“Having examined this group in detail, April 3rd, we continued our voyage towards the west.”

As the position for April 3rd in the "Journal" approximates to the position of Ifalik on the chart, it may be taken as most correct. But the positions of April 2nd and 3rd are most probably for *noon* of each day; and looking at LUTKE's track, Ifalik is certainly westward of  $145^{\circ} E.$

**PARAUPE** is found on CANTOVA's chart, but greatly misplaced; it is also on LUIS DE TORRES's chart. It is stated to have been seen in 1896 by JUAN RODRIGUEZ, and Dr. GULICK says it has been called Gardner island. On most charts it is given as **Farrollep**.

LUTKE visited the group in 1828, and describes it as a reef 4 miles in circumference, on which are three low, wooded islets, the whole enclosing a lagoon. At that date the group was inhabited and very friendly, but the resources of the islets were but poor. Dr. GULICK says it is now deserted.

*Position*.—According to LUTKE's chart and journal, the centre of the group is in about lat.  $8^{\circ} 35\frac{1}{2}' N.$ , long.  $144^{\circ} 36' E.$ ; but the French Chart, No. 1152, places it in lat.  $8^{\circ} 50' N.$ ,—which is probably an error.

**GRIMES island** was reported by Capt. GRIMES, of the Sydney whaler *Jean*, in 1841. He described it as high, well wooded, and 6 miles in circumference, in lat.  $9^{\circ} 16' N.$ , long.  $145^{\circ} 43' E.$

It was also seen in 1855 by Capt. VUE, of the French ship *Chili*, and he stated it to be moderately high, well wooded, and from 5 to 6 miles long, extending N.E. and S.W., in lat.  $9^{\circ} 17' N.$ , long.  $145^{\circ} 11' E.$

More recently it has been reported as "High" island, in lat.  $9^{\circ} 11' N.$ , long.  $145^{\circ} 45' E.$  Nothing further is known of it, and it is not mentioned in Dr. GULICK's list of the Caroline islands.

*Position*.—*Mean* of the three reports, lat.  $9^{\circ} 15' N.$ , long.  $145^{\circ} 33' E.$

**IANTHE** or **FALIFI shoal**.—Under the latter name an *extensive* bank or shoal is shown on CANTOVA's chart of the Caroline islands, which is probably identical with that now generally called Ianthe.

In 1845 the *Ianthe* of New York passed within one or two ship's length of the eastern edge, and apparently the shoalest part of a ridge of sharp rocks not more than 8 to 10 feet under the surface; the water very much discoloured, and of a milky whiteness. Coral branches could be distinctly seen in soundings not exceeding 6 to 8 fathoms: the shoal appeared to extend S. by E. and N. by W., about  $\frac{1}{2}$  a

mile; by good observations and mean of two chronometers, lat.  $5^{\circ} 53' N.$ , long.  $145^{\circ} 39' E.$

The whaler *Nile*, in 1860, passed over a sunken reef, with very little room to spare, the rocks being plainly visible on each side of the vessel, and the men aloft reported breakers on one side; lat.  $5^{\circ} 31' N.$ , long.  $145^{\circ} 42' E.$

*Position.*—The longitude given by the two vessels agrees tolerably well; but there is a great difference ( $22'$ ) in the latitude: no particulars beyond those given above are known of it; the shoal may therefore be *extensive*, as is shown on the old charts; *mean position*, lat.  $5^{\circ} 42' N.$ , long.  $145^{\circ} 40' E.$

*Five islands*, reported in lat.  $7^{\circ} 32' N.$ , long.  $145^{\circ} 31' E.$ , are probably some of the next three groups seen from a distance.

**OLIMARAO.**—This group is on CANTOVA's chart as Olimarau, but is not mentioned by LUIS DE TORRES. It was seen by LUTKE in 1828, and consists of two small low islets surrounded by a reef which extends about 2 miles N.N.E. and S.S.W., or about 5 to 6 miles in circumference. The islets are wooded, and the inhabitants number 200.

*Position.*—The N.E. islet is in lat.  $7^{\circ} 43\frac{1}{2}' N.$ , long.  $145^{\circ} 56\frac{1}{2}' E.$

**ELATO** is on CANTOVA's chart, and is the Elat of LUIS DE TORRES; it may also be the *Haweis* of Capt. WILSON (1793); it was visited by LUTKE in 1828. It consists of a few islets (one named **FALIPi**) and an uncovered reef surrounding a lagoon, the entrance to which LUTKE could not find, as he sought for it on the west side; the group extends north and south about six miles; the inhabitants number about 300.

**TOASS** is a reef, with two islets on the S.E. end of it, stretching  $1\frac{1}{2}$  miles N.W. and S.E., and lies S.E.-ward of the south end of Elato.

LUTKE expresses the opinion that as one of the islets on Elato reef is named Falipi, it may be identical with the Falipi bank of CANTOVA, which in the course of a century has come to the surface. CANTOVA's chart does not bear out this view. It seems more probable that CANTOVA's Falipi is Ianthe bank (*see above*), in which case he has not misplaced it to a greater extent than he did Fais and Faraulep.

*Position.*—The centre is in about lat.  $7^{\circ} 28\frac{1}{2}' N.$ , long.  $146^{\circ} 18\frac{1}{2}' E.$

**LAMOTREK** is mentioned by CANTOVA as Lamurrec, and by LUIS DE TORRES as Mugnak or Lamureck; it is the *Suede*, or Six islands of Capt. WILSON (1793); LUTKE calls it **Wamurrek**. It is a triangular lagoon (apex to the north), with several islets, extending about 6 miles E.S.E. and W.N.W. Population 200.

*Position.*—**Lamotrek**, the S.E. islet, is in lat.  $7^{\circ} 27\frac{1}{2}' N.$ , long.  $146^{\circ} 31' E.$

**FAIU**, the Fahu of CANTOVA, and the Fallao of LUIS DE TORRES, was visited by LUTKE in 1828, and is called by him **West Fayeou** to distinguish it from an island of the same name more to the eastward.

It consists of a small low islet in the middle of a reef extending E.N.E. and W.S.W., and the lagoon forms a small bay. The islet is wooded, but not with cocoa-nut trees; it has no water on it beyond what collects in pits after rain; and there are no inhabitants.

*Position.*—Central islet about lat.  $8^{\circ} 3' N.$ , long.  $146^{\circ} 50' E.$

**SATAWAL**, the Setoeel of CANTOVA, and the Satahual or Setvan of LUIS DE TORRES, was visited by Capt. WILSON in 1793, and called **Tucker** island; in 1824 DUPERREY examined it. It is a circular low coral island, between 2 and 3 miles in circumference, covered with cocoa-nut and other trees, and fringed in every direction by a reef which, however, nowhere extends a  $\frac{1}{2}$  of a mile beyond the island, except off its northern end. Capt. CHEYNE says it is safe to approach as no hidden dangers exist. It contains about 200 inhabitants.

*Position*.—Centre of island, lat.  $7^{\circ} 22' N.$ , long.  $147^{\circ} 6\frac{1}{2}' E.$  (DUPERREY).

**PIKELA**, the Lydia island of DUPERREY's chart, has been considered doubtful, but Dr. GULICK has it in the list of the Carolines, and says it is uninhabited. Nothing further is known of it.

Its *position* is about lat.  $8^{\circ} 38' N.$ , long.  $147^{\circ} 14' E.$

**PIKELOT** is wanting on CANTOVA's chart, but it is the Piguelao of LUIS DE



*Pikelot (Bigali), centre bearing S.  $65^{\circ} W.$ , distant 4 miles.*

TORRES. KRUSENSTERN called it **Coquille** island, after DUPERREY's vessel, but DUPERREY (1824) himself named it **Bigali**, following KADU; LUTKE (1828) calls it **Piguella**.

It is a small low coral islet, less than a  $\frac{1}{2}$  of a mile in diameter, covered with a thick undergrowth of bushes, and some cocoa-nut and other trees, and surrounded by a fringing reef,—the whole being seven-eighths of a mile across, north and south, and rather less east and west. It is uninhabited.

*Position*.—Centre of islet, lat.  $8^{\circ} 11' 53'' N.$ , long.  $147^{\circ} 36' E.$ , according to the French chart No. 1152; DUPERREY made it 4' further east; and LUTKE placed it  $5\frac{1}{2}'$  more south, and 8' more east.

**Oraitilipu bank**, a shoal of 12 fathoms, is placed by LUIS DE TORRES in lat.  $8^{\circ} 6' N.$ , between Faiu and Pikelot, in about long.  $147^{\circ} 15' E.$  LUTKE sought for but could see nothing of it, nor anything to indicate it.

**McLaughlin bank**.—Discoloured water was observed by Capt. McLAUGHLIN of the *Gray Feather* in 1851; soundings were obtained in 18,  $19\frac{1}{2}$ , 24, 30, 45 fathoms, and then no bottom at 115 fathoms. The least water on the bank was supposed to be from 4 to 5 fathoms, in lat.  $9^{\circ} 12' N.$ , long.  $148^{\circ} 6' E.$

**Gray Feather bank**.—Capt. McLAUGHLIN, the day after seeing the bank previously described, again fell in with discoloured water, and sounded in  $19\frac{1}{2}$  fathoms, coral bottom. From aloft the reef could be distinguished as of a circular form, about  $2\frac{1}{2}$  miles in circumference, in lat.  $8^{\circ} 9' N.$ , long.  $148^{\circ} 44' E.$  This may be LUIS DE TORRES' shoal of 24 fathoms.

*St. Bartholomew.*—An island of this name, placed on some charts in lat.  $6^{\circ} 33' N.$ , long.  $148^{\circ} 43' E.$ , has no existence; it is identical with Suk, which is more to the eastward, and which IBARGOITIA supposed might be San Bartolomé (see p. 172), but without any good reason.

**SUK** is the Shoug of CANTOVA, and Sog of LUIS DE TORRES. It was seen by IBARGOITIA in 1799,—hence it has been called **Ibargoitia** island; FREYCINET named it **Pulusuk**.

It is a low coral island, nearly 2 miles in extent, north and south, and surrounded by a fringing reef;—the reef (with the island) is 4 miles long, north and south,—and  $2\frac{1}{2}$  miles wide, east and west; the reef projects furthest from the island off the south point. The island is thickly wooded, and contains about 100 inhabitants.

A coral bank, with irregular soundings of from 10 to 20 fathoms, extends to the distance of 5 miles from the N.W. end of the island, and partly round the north and west sides; a whaler has also reported that it terminates in a dangerous reef, the precise locality of which is not indicated.

*Position.*—The S. end of the island is in lat.  $6^{\circ} 40' N.$ , long.  $149^{\circ} 21' E.$ , according to French chart No. 1152;—RAPEX places it 5' further west.

**Paz bank**,—extent and other particulars unknown—was reported by a vessel called *La Paz*, in 1819; it lies 5 leagues eastward of Suk—hence in about lat.  $6^{\circ} 40' N.$ , long.  $149^{\circ} 40' E.$

**LADY ELGIN BANK** was discovered by Capt. IRONS of the *Lady Elgin*, in 1854. "The ship suddenly came on shoal water, and the bottom (sand and coral) was distinctly seen; sounded in 10 fathoms. Altered the course to S.S.W. and found  $7\frac{1}{2}$  fathoms; hauled to N.N.W. and carried  $7\frac{1}{2}$  fathoms about 1 to  $1\frac{1}{2}$  miles, when broken water was seen bearing north,—and clear water, west. Altered course to W. by N., and deepened to  $8\frac{1}{2}$  fathoms, then 10 fathoms, and finally no bottom; fish and sharks in great numbers."

The *position* given is lat.  $6^{\circ} 18' N.$ , long.  $149^{\circ} 28\frac{1}{2}' E.$

**POLOAT**—the Puluot of CANTOVA and Poloa of LUIS DE TORRES—is possibly the **Kata** islands of Ibargoitia. The group was seen by FREYCINET in 1819; and named the **Enderby isles** in 1826 by Capt. RENNECK, after the firm for whom he sailed.

It consists of two small low coral islands on the same reef—the westernmost named **Alet** and the easternmost **Poloat**. The fringing reef (with the islands) extends  $5\frac{1}{2}$  miles, east and west, and 3 miles in width north and south. Both islands are covered with cocoa-nut trees, and contain together about 100 inhabitants.

*Position.*—The centre of Poloat, the eastern island, is in lat.  $7^{\circ} 19\frac{1}{2}' N.$ , long.  $149^{\circ} 16' E.$ , by French chart No. 1152; RAPEX places it 2' more easterly.

**Enderby bank** is of coral, with 7 fathoms on it, and lies about W.N.W. distant 6 to 8 miles from Alet, the westernmost of the Poloat group.

**Uranic bank.**—FREYCINET's chart of the Poloat group shows a shoal spot of 22 fathoms, E.N.E., distant 6 miles from Poloat, the easternmost island.

**TAMATAM**, according to Dr. GULICK, is the native name given to the group of three islands which old Spanish navigators, and IBARGOITIA (1801) call *Los Martires*, and they are probably the Temetem and Pollap of CANTOVA and LUIS DE TORRES. They were visited by MORRELL, and subsequently by FREYCINET (1819), and DUPERREY (1824).

They consist of three small low islets, each of which is surrounded by a reef, but apparently in no way connected.

The islet and reef of **Tamatam**, the southernmost of the group, is  $1\frac{1}{2}$  miles long, east and west, and rather more than  $\frac{1}{2}$  a mile wide; the islet is about  $\frac{1}{2}$  a mile long, and off its east extremity are four rocks. **Fanadik**, the centre islet, lies N.W. by N. from Tamatam, distant  $2\frac{1}{2}$  miles from centre to centre; the reef and islet are rudely circular, and about  $1\frac{1}{2}$  miles in circumference,—the islet not exceeding a  $\frac{1}{2}$  of a mile in diameter. **Ollap**, the northernmost and largest islet, is 5 miles north of Tamatam, and  $3\frac{1}{2}$  miles N.N.E.  $\frac{1}{2}$  E. from Fanadik; the islet is of an irregular shape, and the reef stretches  $1\frac{1}{2}$  miles eastward of it, and nearly  $2\frac{1}{2}$  miles to the S.W.-ward, but in other directions its extent is less than  $\frac{1}{2}$  a mile. It is said that all the reefs are more or less dangerous.

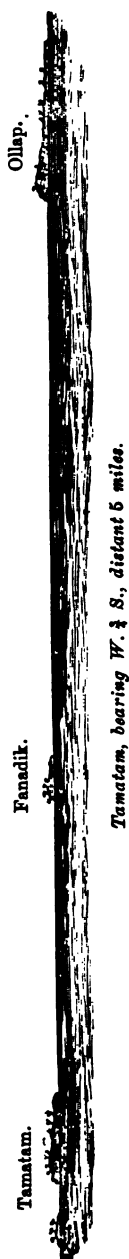
The islets are lightly wooded with cocoa-nut and other trees, but fruits are rather scarce. The inhabitants number about 200, and are considered hostile and treacherous. All together the group offers no inducement for passing vessels to call there. The currents are generally strong between the reefs, and DUPERREY, in June, 1824, found it to set N.W. at the rate of 25 miles a day.

*Position*.—Tamatam (east end of islet) is in lat.  $7^{\circ} 32\frac{1}{2}'$  N., long.  $149^{\circ} 30'$  E.; Ollap, in lat.  $7^{\circ} 37\frac{1}{2}'$  N., long.  $149^{\circ} 30\frac{1}{2}'$  E.

*Shoal*.—Capt. BLACKLOCK of the *Cowiemulzie* (1861) reported that being in lat.  $7^{\circ} 35'$  N., long.  $149^{\circ} 36'$  E.—probably a few miles more to the eastward—he saw the bottom quite distinctly under the ship, and all around her, with casts of 7 fathoms on one side of the ship, and 15 fathoms on the other; he believed the water was much shoaler in some places, as some of the coral heads appeared to him close to the surface. He sailed for 3 miles on an east course, carrying soundings of from 7 to 15 fathoms, then suddenly 30, and no bottom at 100 fathoms. From the edge of the reef the Martyr group of islands is stated to bear W. by S.  $\frac{1}{2}$  S. 20 miles distant, but it is very doubtful if any of them could be seen more than half that distance.

**NAMONUITO**.—Different parts of this group are probably mentioned by CANTOVA and LUIS DE TORRES under the names of Mayor or Magur, Pisaras, and Olol or Ulul,\*—which closely cor-

\* There is much confusion in the distribution of the various groups of the Carolines eastward of  $148^{\circ}$  E., whether on the authority of CANTOVA or



respond to the native names as given by LUTKE. IBARGOITIA in 1801 saw either the northern or western islet, and named it Anonima from not being shown on his chart; MORRELL, in 1832, probably saw the same islet, and called it Livingston. LUTKE, in 1828, visited the group twice,—on one occasion being close to the E. islet,—on the next trip off the northernmost islet, thence passing along the N.W. face of the reef he rounded the W. islet.

The group lies between lat.  $8^{\circ} 32'$  and  $9^{\circ} N.$ ; it is of triangular shape, with the apex to the north, and its base extends 45 miles east and west. It is little more than a coral reef imperfectly enclosing a lagoon, and on the reef are a few scattered islets, only eight of which are at all conspicuous; two of the islets (*Unalik*, &c.) are near the centre of the N.E. side, one (*Pisaras*) is off the easternmost point, two (*Magur*) off the northernmost point, and another (*Ulul*) off the westernmost point; besides these there are a few rocks. All the islets are more or less connected by the reef, but the western side is in some parts merely a sunken barrier,—as is also the south side; the lagoon (in which LUTKE passed three days) has also several coral banks in it. The islets together contain about 50 inhabitants.

*Position*.—Magur (Maghyr of LUTKE), the N. islet, is in lat.  $8^{\circ} 59\frac{1}{4}' N.$ , long.  $150^{\circ} 14\frac{1}{2}' E.$ ;—Pisaras (Piserar of LUTKE), the E. islet, in lat.  $8^{\circ} 34' N.$ , long.  $150^{\circ} 32' E.$ ;—Ulul (Onoone of LUTKE), the W. islet, in lat.  $8^{\circ} 35\frac{1}{2}' N.$ , long.  $149^{\circ} 47' E.$  This group should be approached with great caution.

*Mannaijen bank*, reported to have 21 fathoms on it, and on which LUIS DE TORRES sailed for three days, lat.  $8^{\circ} 20' N.$ , long.  $149^{\circ} E.$ , was not found by LUTKE, who sought for it after leaving the Namonuito group: he sailed on this parallel as far as long.  $148^{\circ}$ , finding no bottom at 50 fathoms. It may possibly represent portions of the submerged reef of Namonuito.

*Shoal*.—Capt. ALMOND of the *Decapolis*, May, 1869, reports a large patch of breakers in lat.  $8^{\circ} 26' N.$ , long.  $150^{\circ} 20' E.$ ; he passed it within  $1\frac{1}{2}$  miles, but no soundings were taken. This also may be part of the Namonuito reef.

**FAIU** (or **EAST FAIU**, as there is another island of the same name to the westward) has also been called *Lutke* island. It was visited by LUTKE in 1828, and found to be a low coral islet surrounded by a fringing reef about 1 mile long and  $\frac{2}{3}$  of a mile wide, covered with cocoa-nut and other trees. It contains about 50 inhabitants; and the Carolinians in passing occasionally call there for water, which is collected in a natural basin.

*Position*.—The centre of East Faiu is in lat.  $8^{\circ} 33' N.$ , long.  $151^{\circ} 26' E.$

DON LUIS DE TORRES. CHAMISSE says, "the relative situation of the islands may be more easily obtained from the accounts of the natives, than their distances. The points of the compass may be pointed out with precision; the distances, according to the time required for the voyage, and even here, all measure of time is wanting. CANTOVA appears, in drawing his chart, to have commenced like DON LUIS DE TORRES, from Ulea (Woles), which he properly marks to the south of Guahon (Guajan). Both of them had fixed points for the western part, between which it only remained to place the other islands. This was not the case for the eastern part, where they had unlimited space open to them. We can only wonder at the accidental agreement of the standard which they have applied."

**NAMOLIPIA-FANE**—the *Fananu* of LUTKE—is 40 miles in circumference, extending 16 miles east and west, and 13 miles N.N.E. and S.S.W. On and within the reef are thirteen small, low and wooded coral islets—the largest not more than  $\frac{3}{4}$  of a mile long, the principal being *Fananu* and *Ikop* on the east end, and *Namuine* near the south end. The reef is here and there submerged, and dangerous. The entrance to the lagoon is on the S.E. side of the group. The islets contain about 50 inhabitants.

*Position*.—*Namuine* islet is in lat.  $8^{\circ} 25\frac{1}{2}'$  N., long.  $151^{\circ} 49\frac{1}{4}'$  E.; *Ikop* islet, lat.  $8^{\circ} 34'$  N., long.  $152^{\circ} 1'$  E.

This group may be the *Lamoil* of CANTOVA, and *Namuhil* of LUIS DE TORRES; and *Fananu* islet may be the *Felalu* or *Falatu* island mentioned by them.

**MORILEU**, perhaps the *Marilo* of LUIS DE TORRES, was examined by LUTKE and called *Murilleu*. The group consists of nine islands, the largest being *Morileu*, *Rua*, and *Namorus*. The reef is 21 miles long E.N.E. and W.S.W., and 10 miles wide at utmost; but the greater part of the leeward side is submerged, and does not show except through the greenness of the water, hence it is dangerous to approach, and during the night a vessel would probably be lost. The entrance into the lagoon, which is on the S.E. side immediately south of *Rua* island, is wide and deep—sufficient even for large ships—and there may consequently be good anchorage, but this is unknown. The islets are small, low and wooded; and those towards the windward side contain about 100 inhabitants.

*Position*.—*Morileu*, the easternmost islet, is in lat.  $8^{\circ} 42'$  N., long.  $152^{\circ} 25\frac{1}{4}'$  E.;—*Rua* island is in lat.  $8^{\circ} 38'$  N.

The *Namolipia-fane* and *Morileu* groups constitute the *Hall islands*, as they were stated by Capt. SALIZ of *Le Péruvien* (1825-1827) to have been discovered by a Capt. HALL in 1824, who named the channel between the two groups (after his ship) *Lady Blackwood passage*.

**TRUK** is the *Hogolu* of CANTOVA, and *Torres* of SERRANO, and was probably discovered by the old Spanish navigator QUIROSA. The N.E., north, west, and S.W. sides were examined by DUPEREY in 1824; and the south and S.E. parts by D'URVILLE



Truk Islands.—Toi (A), bearing S.  $18^{\circ}$  E. (true), dist. 8 miles.



Truk Islands.—Toi (B), bearing N.  $20^{\circ}$  E. (true) dist. 10 miles.

in 1828 and 1838; LUTKE passed the west extremity in 1828, and it is marked on his chart as **Rug**. MORRELL in 1830, supposing it a new discovery, gave the group the name of Bergh; while CHRYNE and others when passing the southern end, have taken that part for a distinct group, and called it the Royalist islands.

Some of the islands mentioned by CANTOVA and LUIS DE TORRES can be recognised as members of this group, such as **Pis** (the northernmost islet), **Ruac**, an island on the north-east side, &c.

Truk is the largest group of the Caroline islands; it consists of 6 or 8 large islands, and about 60 of smaller dimensions; the majority being little more than islets. The group extends from lat.  $6^{\circ} 58'$  to  $7^{\circ} 43'$  N., and between long.  $151^{\circ} 23'$  and  $152^{\circ} 1'$  E.; it is one of the *high* groups, being a collection of basaltic islands and islets surrounded by a large and distant reef, which is partly lagoon and partly fringing.

The large islands are distributed over the centre of the reef.

**Tol**, the largest and westernmost island, is 8 miles within the west edge of the reef; but as this part of the reef trends towards the east, its outer edge comes much closer to the north and south sides of the island. Tol, 6 miles long and 5 miles wide, has a very irregular outline, consisting as it were of five promontories stretching from the centre; on each projection there is a conspicuous hill,—that to the S.E. attaining an elevation of 700 feet.

Eastward of Tol, at the distance of 12 miles, is **Rug** or **Ruk** island,—the Falang of DUPERREY's chart; it is 4 miles long (N.N.W. and S.S.E.), rather more than a mile wide, and 600 to 700 feet high. A ridge of hills runs through its centre.

To the north (easterly) of Rug, at the distance of  $3\frac{1}{2}$  miles, is **Moen** island,—the Iros of DUPERREY's chart; it is  $3\frac{1}{2}$  miles long (north and south),  $3\frac{1}{2}$  miles wide (east and west), and has on it three or four conspicuous peaks, the loftiest about 1000 feet high.

N.E.-ward of Rug, and southward of Moen, is **Dublon** island, which, like Moen, is a compact mass with two or three small peaks on it.

S.E.-ward from Rug, at the distance of a mile, is **Umol** island,—the Chamisso of DUPERREY's chart. It is smaller than the islands previously described, and is marked by a single peak.

S.W.-ward of Rug, at the distance of a mile, is **Tsis** island, off the N.W. end of which there is anchorage, and where water may be procured.

**Udot** is a small and irregular-shaped island, but conspicuous by its peak, and in fact the principal island between Tol on the west, and Rug and Moen on the east,—within which area there are six or seven other high islets.

The edge of the reef is  $7\frac{1}{2}$  miles north of Udot, where there is a slight indentation; thence it trends northward and eastward to **Pis** the northernmost low island, where it does not come within 14 miles of the north end of Moen; but subsequently trending east, S.E., and south, it approaches the east end of Moen within 5 miles. The north and N.E. side of the reef has on it twenty or more low islands and islets, near one of which, **Ruac** (evidently mentioned by CANTOVA), there is a small opening. S.E.-ward and southward from Umol there are more low islands near the edge of the

reef, the principal being **Bolsduval**, **Jacquinet**, and **Givry**,—the former 9 miles, and the latter 11 miles from Umol: these are probably the Cuop or Cuap islands of **CANTOVA**. From Givry and Jacquinet the reef sends out a spur to the S.E., and on it are a few very small low islets; the southernmost of which (for lack of a better name) is called **South** island;—these are probably the Royalist islands of Capt. **CHEYNE** and others. The south side of the barrier approaches within 7 miles of Tol, and 6 miles of Tsis. All the islands and islets near the edge of the barrier are small, low, and of coral formation.

The northernmost island on the reef, **Pis**, is  $1\frac{1}{2}$  miles long, east and west; the westernmost islet is named **Torres**.

There are four (if not more) entrances leading through the outer reef to the inner large islands, viz., on the N.W., S.W., South, and East sides. **MORBELL** took his vessel through the S.W. opening. **CHEYNE** says "there are several passages leading to the lagoon, with anchorage within the reef near the shore of the large islands. In sailing through the lagoon a careful masthead look-out is indispensable, as there are many coral patches in it." The *Astrolabe* (1838) entered through an opening S. by W  $\frac{1}{2}$  W. from the south end of Tsis, and found soundings of 26 fathoms and upwards inside the barrier between Tsis and Tol, with coral and rocky heads here and there. The anchorage is off the N.W. end of Tsis, about  $\frac{1}{2}$  of a mile off the shore, in 20 fathoms. The island is covered with cocoa-nut and other trees, and water is abundant on the north side.

The total population amounts to 5000 or 6000, principally collected on the large islands of the group. The chiefs are often at war among each other, rendering the people treacherous and untrustworthy. Vessels calling to collect *biche-de-mer*, &c., have frequently been attacked and lost part of their crews; merchant ships when passing should never admit large numbers of natives on board.

**Position**—**Pis** island, centre of N. side, is in lat.  $7^{\circ} 42\frac{1}{2}'$  N., long.  $151^{\circ} 46'$  E.; **Torres** isle, lat.  $7^{\circ} 19\frac{1}{2}'$  N., long.  $151^{\circ} 24'$  E.; peak of Tol, lat.  $7^{\circ} 20\frac{1}{2}'$  N.; South islet lat.  $6^{\circ} 58'$  N., long.  $151^{\circ} 57'$  E.; easternmost islet on the reef, lat.  $7^{\circ} 20'$  N., long.  $152^{\circ}$  E.; Tsis islet (anchorage), lat.  $7^{\circ} 18\frac{1}{2}'$  N., long.  $151^{\circ} 48'$  E.

**LOSAP.**—This group was visited by **DUPERRÉY** (1824), and by **D'URVILLE** (1838). **MORBELL**, in 1830, thinking it a new discovery, gave it the name of the Westervelt islands.

It consists of a small island (named **D'Urville**) a mile long, and surrounded by a narrow reef; to the S.E. of which, at the distance of 10 miles, is another small island, close to the edge of a reef which extends 5 miles in a westerly and the same distance in a southerly direction; on this end of the reef are two or three mere islets or rocks. It is uncertain whether D'Urville island is on the main reef, or whether it is detached from it; the French chart shows it detached. The islands are low, and of coral formation; and they are covered with cocoa-nut and bread-fruit trees. The reef is resorted to for *biche-de-mer*. The islands contain about 200 inhabitants.

**Position**—D'Urville island (centre) is in lat.  $6^{\circ} 59\frac{1}{2}'$  N., long.  $152^{\circ} 33\frac{1}{2}'$  E.; the easternmost island on the southern reef, lat.  $6^{\circ} 54'$  N., long.  $152^{\circ} 42'$  E.

The *Royalist islands* (already mentioned, p. 198), situated in lat.  $6^{\circ} 47' N.$ , long.  $152^{\circ} 8' E.$  (according to Capt. CHEYNE), are probably the southern extreme of the Truk group. The position assigned them was passed over by the *Astrolabe*.

**MOKOR.**—This is an uninhabited and probably very small group mentioned by Dr. GULICK. The position given is lat.  $5^{\circ} 42' N.$ , long.  $152^{\circ} 43' E.$ ; nothing further is known of it, and no such group has heretofore been marked on charts. It cannot be the Hashmy islands as the Doctor supposes, for these were reported to be well peopled. The group may nevertheless exist; LUTKE's track from the Mortlock islands to Namoluk is to the east of it, and he might readily miss it, as Namoluk was passed at the distance of 12 miles without being visible.

**NAMOLUK.**—This group was visited by LUTKE (1828), when proceeding northward from the Mortlock islands. MORRELL, in 1830, thinking it a new discovery, called it the Skiddy group; in 1833 it was probably reported as the Hashmy group. It is said to consist of five low coral islands, connected by reefs forming a lagoon; the larger islands are from 3 to 5 miles in circumference, 100 feet high, and well wooded with cocoa-nut, bread-fruit, and other trees;—the whole group being about 15 miles in circuit. There is apparently no passage into the lagoon, but the reef is safe to approach within 200 yards in every direction. The group yields *bêche-de-mer* and pearl oysters. The inhabitants are an able-bodied race, and number about 300, but are not to be trusted.

*Position.*—Amesse, the S. islet, is in about lat.  $5^{\circ} 54\frac{1}{2}' N.$ , long.  $153^{\circ} 16\frac{1}{2}' E.$ ;—the N.E. islet is Toinome,—and the W. islet, Namoluk.

The **Mortlock islands** is the name applied to three distinct groups of coral islands and reefs known respectively as Etal, Sotoan, and Lukunor. They were so named after the discoverer, Capt. J. MORTLOCK, of the *Young William*, who passed along the south side of them in 1793. They have also been called after his ship. LUTKE examined them thoroughly in 1828.

**SOTOAN.**—This is an oval-shaped lagoon, 17 miles long (N.W. and S.E.), and 12 miles wide, with one if not two openings into it. On the barrier are a few islands and many islets—probably sixty or more—the greatest number being on the east and S.E. sides. Ta, the largest island, forms the S.E. bend of the reef, and is about 6 miles long, but not more than  $\frac{1}{2}$  a mile wide: there is another large island close to it, and all the others are small in comparison. "There is a good passage through the reef at the S.W. part of the group, between the west point of the westernmost large island (on the south side), and a small woody islet that lies to the N.W. of it: the passage is near the islet, and anchorage, in 20 fathoms, will be found about  $\frac{1}{2}$  a mile N.N.E. of it: there are some coral patches within the entrance, but they can always be seen and avoided. The islands at the further end of the reef are not visible from the anchorage."—(CHEYNE).

All the islands and islets are low, but well wooded with cocoa-nut, bread-fruit, and other trees. The population is about 500. CHEYNE says they are an able-bodied race, of light complexion, lazy, and unwilling to work.

*Position.*—The group lies between lat.  $5^{\circ} 16'$  and  $5^{\circ} 31' N.$ , and between long.  $153^{\circ} 34'$  and  $153^{\circ} 51' E.$ ;—the opening into the lagoon at the W. end of Ta island, lat.  $5^{\circ} 17' N.$ , long.  $153^{\circ} 44' E.$

**ETAL.**—This group lies north of Sotoan, and is about 6 miles in circumference; it consists of four low islands, thickly wooded, connected by a reef which forms a lagoon. There are on the islands about 200 inhabitants.

Capt. CHEYNE says the *channel* between Sotoan and Etal is 5 miles wide, and clear of danger.

*Position.*—The N. point is in lat.  $5^{\circ} 37' N.$ , long.  $153^{\circ} 42\frac{1}{2}' E.$

**LUKUNOR**, possibly the Lugulos group of OLOPOL and LUIS DE TORRES, is called **Lugunor** by LUTKE, who examined it with some care. It is an oval-shaped lagoon, lying N.W. and S.E., and about 18 miles in circuit, having on the reef many small low islands and islets which are covered with cocoa-nut, bread-fruit, and other trees.

**Lukunor** island lies at the eastern angle of the reef, and being in the shape of a horse-shoe, forms an excellent harbour, which has been called after **Chamisso**, the naturalist of KOTZEBUE's voyages, and the first trustworthy historian of the Caroline archipelago. The island varies in breadth at different parts from  $\frac{1}{2}$  of a mile to 100 or 150 yards; towards the centre it attains an elevation of 7 feet above the water level, and is there well wooded; the northern end is lower, and affords a good vegetable mould, which is cultivated principally with *arum*, and well irrigated by means of artificial channels.

The only fresh water is that collected during rains in the trenches and reservoirs; hence it is generally brackish and smells,—moreover, the abundance or scarcity of the article must depend on the quantity of rain that falls. The natives drink but little, and usually refresh themselves with the cocoa-nut. Wood for ships' use is scarce. Cocoa-nuts are always abundant; other fruits can only be procured in the season. Some poultry and pigeons may also be obtained. But the island offers no more resources than any other low coral island.

The natives number about 200, and are of middle size. Their language is more difficult to pronounce and more disagreeable to the ear than that of some of the more easterly islanders, as at Kusaie (Ualan), &c. They are active on the water, passing much of their time in canoes, which are well built, many of them large, and managed with great skill and judgment; they never scruple at undertaking a long voyage, and are indeed the most easterly of the Carolinians that do so.

LUTKE (1828) speaks highly of their hospitality and friendliness; others, and more recently, speak badly of them, but they are probably what they have been made by unscrupulous visitors.

*Position.*—Chamisso harbour, lat.  $5^{\circ} 29' 20'' N.$ , long.  $153^{\circ} 58' E.$

**NUKUOR** is the **Monteverde** of LUIS DE TORRES, and probably the Nugor of KADU; it was discovered by DON JUAN MONTEVERDE, of the Spanish frigate *La Pala*, in 1806. MORRELL visited it, and described it in 1830; a plan of it (under the name of Nugur) was made by the officers of the *Astrolabe* (1838); and

Capt. R. L. HUNTER communicated with the natives in 1841, and gave a brief description of it.

It is oval-shaped, 5 miles long (N. and S.), 4 miles wide, and about 14 miles in circumference; it has a lagoon, but apparently no passages into it larger than what will admit boats. The islands and islets are low and numerous, and they are ranged close together on the north, east, and S.E. sides of the barrier, with none to the westward; the surrounding reef abounds with *bêche-de-mer* of superior quality, and turtle frequent the shores in the season.

The islands are well wooded; and the natives, 500 in number, are tall, handsome, well made, and active, resembling the natives of the Navigator group. They barter cocoa-nuts, small cord rope, and fish, for iron hoops and knives. Their canoes are strong, large, and well-modelled, with outriggers—some of them carrying twelve men.

*Position*.—Centre of group, lat.  $3^{\circ} 52' N.$ , long.  $154^{\circ} 59' E.$ ; centre of easternmost islet, lat.  $3^{\circ} 52' N.$ , long.  $155^{\circ} 14' E.$ ,—both according to D'URVILLE's plan; but French chart No. 1152 places the group 4' more to the west; Capt. HUNTER made it 3' more west. MONTEVERDE's original determination of the position was 25' more south, and 50' more east, in which by some oversight it is retained by RAPER.

*San Rafael*.—An island under this name was reported by MONTEVERDE in 1806, and stated to be in lat.  $7^{\circ} 18' N.$ , long.  $153^{\circ} 54' E.$ ; nothing further is known of it, nor has it been reported since; but that he placed Nukuor much too far east instead of west, it might be taken as Bordelaise or St. Augustin island.

*Dunkin reef*.—An extensive shoal, stretching north and south, was reported by Capt. DUNKIN in 1824; its south end was stated to be in lat.  $8^{\circ} 55' N.$ , long.  $154^{\circ} E.$ ; RAPER places the centre in lat.  $9^{\circ} 15' N.$ , long.  $154^{\circ} E.$ ; the Admiralty chart No. 2463 places it in long.  $154^{\circ} E.$ , and between lat.  $9^{\circ}$  and  $9^{\circ} 33' N.$

A reef—whaler's report—is said to have been discovered in lat.  $9^{\circ} N.$ , long.  $154^{\circ} E.$ , and this would seem to confirm the existence of Dunkin reef, which, until better information has been obtained, may be taken to be in the approximate lat. and long. given on the Admiralty chart.

Dunkin reef is certainly not the Orouloug bank, as has been supposed, the latter being in reality the Oraluk group (see p. 203), the greatest part of which is reef without islets.

The French chart No. 1152 ignores Dunkin reef in the position assigned by the reputed discoverer,—the *Astrolabe* and *Zélée* having passed very close to it in 1838.

*Minto reef*.—Capt. WISHART, of the *Countess of Minto*, in 1842 reported "a patch of breakers in lat.  $8^{\circ} 10' N.$ , long.  $154^{\circ} 34' E.$ ; dry in some places, particularly the north end, and extending N.W. and S.E."

In 1854 Capt. A. COSTELLO, of the *Sofia*, bound from Sydney for Hong Kong, saw a reef with a wrecked vessel on it, and spent some hours in its vicinity to determine if any persons were on board. "The form of the reef is that of an ellipse, 7 miles east and west, and about 2 miles north and south. A small portion of the east

end, where the hull lay, was dry, but at high water it might be covered: the rest of the reef was either level with the water or a few feet under it, the sea breaking over the whole extent. The position of the east end is, lat.  $8^{\circ} 8' N.$ , long.  $154^{\circ} E.$ "

Capt. WEBB, of the *Mildman*, in 1858 saw a reef, the west end of which he placed in lat.  $8^{\circ} 8' N.$ , long.  $154^{\circ} 29' E.$  A ship was on shore on the west side of the reef, also a schooner with nothing but the two masts sticking up; a boat was sent to the ship, which approached it as near as the surf on the reef permitted.

More recently a whaler has reported a reef, 10 miles long, in lat.  $7^{\circ} 56' N.$ , long.  $154^{\circ} 20' E.$

*Position.*—It may be concluded therefore that Minto reef is about 8 miles long, east and west, and in lat.  $8^{\circ} 8' N.$ ,—long. of W. end  $154^{\circ} 17' E.$ , and long. of E. end  $154^{\circ} 25' E.$

**ORALUK.**—In 1773 DON FELIPE TOMPSON (as recorded in some works and on some old charts) discovered a low group said to consist of a reef, partly submerged, with a small low island (San Augustin) on the N.W. end, and a smaller and lower one (Baxo-Triste) on the centre of the east side, the whole extending  $5\frac{1}{2}$  leagues N.W. by W. and S.E. by E.; the longitude given by TOMPSON was, as might be expected, considerably in error, perhaps to the extent of a degree too far east.\* FREYCINET's chart, following TOMPSON, places the centre of San Augustin in lat.  $7^{\circ} 24' N.$ , long.  $156^{\circ} 7\frac{1}{2}' E.$

In 1826 Capt. SALIZ, of *Le Péruvien*, reported a small low coral island, 2 miles long and 60 feet high, with a reef projecting 15 miles to the S.E.-ward. The reef formed a lagoon, and the island, which was not visible from the S.E. extreme, is in lat.  $7^{\circ} 39' N.$ , long.  $155^{\circ} 5' E.$ ; the island received the name of *Bordelaise*.

In 1827 Capt. M. JOHNSON, of the *Guilford*, reported an island 60 feet high,  $\frac{1}{2}$  a mile in extent, with cocoa-nut trees on it. With the island bearing N.E.  $\frac{1}{2}$  N., distant 4 or 5 miles, the sea was seen to break high upon a reef extending 5 miles in a southerly direction from the S.E. point of the island, and a chain of breakers stretched from the island E.S.E., as far as could be perceived from the masthead, showing the danger to be great in an easterly direction from the island. From the N.W. point, the broken water did not appear to extend above a mile, and the S.W. side of the island seemed clear of danger. It was named *Jane* island, and the position given is lat.  $7^{\circ} 33' N.$ , long.  $155^{\circ} 3' E.$  by lunar.

H.M.S. *Vestal* in 1844 saw land bearing N.W. by N., "supposed to be Jane island; the wind on approaching the island veered, and hauled between E.N.E. and N.N.E., very squally, with rain, so that no satisfactory longitude could be obtained, but as well as our means would permit the position of the island appeared to be on the western extremity of an extensive reef stretching E.S.E. for 2 or 3 leagues, breaking heavily, and then apparently bending to the northward, in which direction (and bearing from the island we were then passing about E.N.E., 3 leagues) was indistinctly seen by the masthead man only, another island. The western island, to the westward of which we passed, was low." The position assigned the island is

\* TOMPSON also discovered the Ngatik group or Los Valientes, which, according to LUTKE's later observations, he placed  $1^{\circ} 4'$  too far east; hence the inference of the degree of error respecting Oraluk.

lat.  $7^{\circ} 38' N.$ , long.  $155^{\circ} 20' E.$  The captain of the *Vestal* took the N.E. island to be the **Meaburn** of **NOBIL**'s chart, which, however, is placed in lat.  $7^{\circ} 44' N.$ , long.  $155^{\circ} 18' E.$

A dangerous reef (**Larkins** or **Campbell reef**) was reported by Capt. W. CAMPBELL of the *Larkins*, in 1830: "its N.E. extremity in lat.  $7^{\circ} 36' N.$ , long.  $155^{\circ} 18' E.$  It was found to lie in a N.E. and S.W. direction, and is so extensive that the whole of it could not be seen from the N.E. end. It is about 14 miles in a W.S.W. direction from Bordelaise island, discovered in 1826." Here Baxo Triste is evidently taken to be Bordelaise.

In 1862, Capt. P. A. PALACE, of the *Esmeralda*, says, "I saw a very extensive shoal connected with Bordelaise island; it is very dangerous coming up from the S.E.; the island, 50 feet high, cannot be seen from the S.E. point of the reef."

From these imperfect data it appears that Oraluk is a lagoon reef, extending N.W. by W. and S.E. by E., about 18 miles. Off the N.W. extremity of the reef is the low coral island of San Augustin, which, by most navigators, is known as Bordelaise; it is stated to be from  $\frac{1}{2}$  a mile to a mile long, 100 feet high (including probably the tops of the trees), and not visible more than 10 to 12 miles at the utmost—hence never seen from the opposite side of the reef. An Oahu schooner was wrecked here in 1843; Capt. PEBNET and the crew remained on the island five months, and built a small vessel in which they proceeded to Guajan.

It is probable also that somewhere on the east side of the reef, perhaps near the centre, there is another but smaller island—indeed a mere islet—called Baxo Triste, and not unfrequently Bordelaise; this islet is low and wooded. Of the north side of the reef nothing is known; of the other parts much of it is probably submerged, presenting openings into the lagoon, but the more dangerous from nothing being known of them. All navigators agree that a wide berth should be given to the reef, especially during the strength of the N.E. trade; the currents are always uncertain. The group is uninhabited.

*Position.*—So far as the foregoing remarks afford any clue to the position of Oraluk, it would appear that San Augustin or Bordelaise, the N.W. island, is in about lat.  $7^{\circ} 37' N.$ , long.  $155^{\circ} 9' E.$ ;—the S.E. extreme of the reef, lat.  $7^{\circ} 27' N.$ , long.  $155^{\circ} 24' E.$ ; and Baxo Triste islet in about lat.  $7^{\circ} 31' N.$ , on the east side of the reef.

Admiralty chart No. 2463 places San Augustin in lat.  $7^{\circ} 43' N.$ , long.  $155^{\circ} 7' E.$ ; and Baxo Triste or Bordelaise in lat.  $7^{\circ} 38' N.$ , long.  $155^{\circ} 25' E.$

The French chart No. 1152 places San Augustin in lat.  $7^{\circ} 24' N.$ , long.  $155^{\circ} 56' E.$ ; and Baxo Triste in lat.  $7^{\circ} 17' N.$ , long.  $156^{\circ} 9' E.$

A reef, in lat.  $7^{\circ} 21' N.$ , long.  $156^{\circ} 30' E.$ , has been reported, and is said to stretch 80 miles, but this is probably an exaggeration,—being a whaler's report. It may possibly be the S.E. end of Oraluk, but this is not certain. The ship *Isabella* was wrecked on it.

**NGATIE.**—This group was discovered by Capt. F. TOMPSON in 1773, and called **Los Valientes**. It was seen in 1793 by Capt. MUSGRAVE of the *Sugar-cane*, and named the **Seven islands**, and subsequently the **Heaven islands** when seen by the *Britannia*. LAFITA passed close to the group in 1802; and LUTKE examined it in

1828, calling it Ngaryk, finding the plan made by TOMPSON tolerably accurate, but  $1^{\circ} 4'$  too far eastward.

The reef is triangular, 22 miles in circuit, with eight low coral islands on it. LUTKE says the reef is continuous and without a passage into the lagoon. TOMPSON had stated that there was a channel on the south side through which the canoes of the natives were navigated: more recently, the master of the *Brougham* (whaler) reports an opening between the west and north islands. The south side is nearly 10 miles long, N.E. by E. and S.W. by W., having an island at each angle, and another about 3 miles west of the easternmost. The reef trends N.W. from the east extremity, and N. by E. from the west, coming to an apex at the northern island. The remaining islets are principally on the N.E. side of the triangle. It would appear from the different accounts of navigators that sometimes one island and sometimes another is inhabited,—that sometimes canoes are to be seen, at other times none. At present the group contains about 30 inhabitants. The islands are well wooded with cocoa-nut, bread-fruit, and other trees. Some years ago four Englishmen and twenty natives from Ponapi resided on the western island; they reared pigs and fowls, and supplied whalers.

*Position.*—The E. extreme is in lat.  $5^{\circ} 48' N.$ , long.  $157^{\circ} 31\frac{1}{2}' E.$

The **SENIAVINA ISLANDS** is the name given to three of the Caroline groups—Pakin, Ant, and Ponapi—which were discovered and examined (with some care) by LUTKE in 1828. They were called after his ship, the *Seniavina*, and lie between lat.  $6^{\circ} 43'$  and  $7^{\circ} 8' N.$ , and between long.  $157^{\circ} 54'$  and  $158^{\circ} 30' E.$  They were subsequently (1840) visited and partially surveyed by the French corvette *La Danaïde*, Capt. ROSAMEL.

**PAKIN**—the northernmost and westernmost of the Seniavinas—is called by LUTKE the **Paguenema group**, and lies 23 miles W.  $\frac{1}{2}$  N. from the peak of Jekoits in Ponapi. It consists of five islands and three or four small islets, connected by a reef (which forms a crescent-shaped lagoon) extending about  $5\frac{1}{2}$  miles N.W. and S.E. There is an island near each extremity of the reef, and the rest are on its N.E. face. The S.E. island is **Katelma**, which lies east and west;  $1\frac{1}{2}$  miles to the northward of it is **Ta**, from which the next island (**Tagaik**) lies 2 miles in a N.W. direction; **Kapenuar**, the largest island, stands on the N.W. end of the reef. All the islands and two or three of the islets are covered with cocoa-nut, bread-fruit, and other trees; but some of the islets are mere sandbanks covered with brushwood. Poultry is plentiful. There is no passage into the lagoon, but it abounds in fish. The number of inhabitants is about 50, ruled over (1848) by a Ponapian chief, who resides on Kapenuar. The people manufacture canoe sails from the leaves of the pandanus, which are much sought after. The channel between Pakin and the reef surrounding Ponapi is clear of danger.

*Position.*—The centre of the S. side of Katelma, lat.  $7^{\circ} 1\frac{1}{2}' N.$ , long.  $157^{\circ} 58' E.$ ; the west extreme of Kapenuar, lat.  $7^{\circ} 4\frac{1}{2}' N.$ , long.  $157^{\circ} 54\frac{1}{2}' E.$

**ANT**—the **Andema group** of LUTKE—lies  $14\frac{1}{2}$  miles from the peak of Mutok

and 9 miles west of the entrance to Kiti harbour in Ponapi, between lat.  $6^{\circ} 43'$  and  $6^{\circ} 50\frac{1}{2}'$  N. Some of the Pacific traders call it **FRASER** island, others William IV.,—names applied to it from the reports of Capt. FRASER, of the *Planter*, in 1832. The group consists of four low well-wooded coral islands, and several islets situated near the S.E. face of a reef which forms a lagoon, rudely triangular, the apex being to the N.W., and there is said to be a boat passage into the lagoon between the large easternmost island and the islets west of it. There are no inhabitants, but the group belongs to one of the Ponapi chiefs. It is resorted to from May to September for turtle, and at other times for cocoa-nuts and bread-fruit.

The channel between Ant and the reef of Ponapi is 6 miles wide, and clear of danger; but a ship is liable to get becalmed in it, with a strong N.E. Trade-wind, as the high land of Ponapi intercepts its regular course: Capt. CHEYNE says:—"I experienced this in March, 1853, as I lay four hours becalmed in the passage, although a strong breeze was blowing outside; and in the afternoon, when the regular wind set in, it was so far northerly as to oblige me to beat through." LUTKE, in 1828, when approaching the group, was nearly drifted on it by the heave of the sea, owing to being under the lee of Ponapi, and the wind failing.

*Position*.—The S. island, lat.  $6^{\circ} 43'$  N., long.  $158^{\circ} 4'$  E.; the N.E. islet, lat.  $6^{\circ} 48'$  N., long.  $158^{\circ} 9'$  E.; N.W. apex of reef, lat.  $6^{\circ} 50\frac{1}{2}'$  N., long.  $158^{\circ} 2\frac{1}{2}'$  E.

**PONAPI**.—This group of islands, with the reef surrounding it, lies between lat.  $6^{\circ} 45'$  and  $7^{\circ} 3'$  N., and between long.  $158^{\circ} 11'$  and  $158^{\circ} 30'$  E. It was examined by LUTKE in 1828, and partially surveyed by the French corvette *La Danaïde* in 1840. It has frequently been visited by Capt. CHEYNE; and the officers of H.M.S. *Larne* surveyed Kiti harbour on its S.W. side in 1839. Dr. GULICK, who has resided there, made it the subject of a memoir in SILLIMAN'S "Journal of Science." From these sources the following account of the group is compiled. It may be the group called Falupet by CANTOVA, and Fanope by KADU; and was probably first seen by QUIROSA in 1595, on his voyage to the Philippines from Santa Cruz, after the abandonment of the attempt to settle there. FREYCINET supposed that QUIROSA'S discovery might be Hogolu (the Truk group), but the irregularly scattered islands and islets in the immense lagoon of Truk do not answer QUIROSA'S description of "a large island of 30 leagues circumference" so well as Ponapi.

There are several vague traditions which render it certain that the group was seen by different voyagers during the 17th and 18th centuries, and during the first quarter of the 19th century, without anything having been added to the vague discovery of QUIROSA. There is a native tradition of a boat's company having landed on the south side of the island who had such peculiar skins that they could only be killed by piercing the eyes; they were probably Spaniards clothed in mail. The figure-head of a junk was found in the Metalanim district, which the natives say belonged to a vessel wrecked there, and which first brought fowls to the island. A China bowl, a copper teapot, Spanish silver coins, a silver crucifix, a pair of silver dividers, and a brass cannon, with other relics, point to earlier visitors. Yet Ponapi cannot be said to have been discovered till LUTKE of the Russian corvette *Seniavina* first saw it, January 2nd, 1828.

The Ponapi group (**Pouynepet** of LUTKE and **Bonnebey** of the French) consists of several islands, surrounded by a coral reef  $18\frac{1}{2}$  miles long (N. and S.),  $17\frac{1}{2}$  miles wide (E. and W.), and about 60 miles in circumference. The large basaltic island named **Ponapi**, and sometimes **Ascension**, 12 miles (N. and S.), and  $14\frac{1}{2}$  miles (E. and W.), occupies nearly the whole of the enclosed area, giving its name to the whole group. Twelve or more basaltic islands and islets are more or less detached from the main island, adding much to the scenery of certain parts, and increasing the area of habitable land; while upon the coral reef itself are from fifteen to twenty small coral islets, in every respect similar to those of the purely coralline groups.

DESCRIPTION.\*—"The height of what LUTKE named Monte Santo (on the French chart, Tolocolme), in about lat.  $6^{\circ} 53' N.$ , is 2861 feet. Several other points approach it in elevation. A somewhat continuous range of hills extends from Uu of the Waneka district, westward to Paleka, of the Jekoits district. The terminations of the range are somewhat gradual slopes. The general line of the range is that of a curve, convex southward. The eastern third, or perhaps half, is narrow and almost equally precipitous on the northern and southern aspects, presenting in many places, as in Uu, perpendicular faces of rock of great height, that show strong columnar tendencies. The middle third of the range slopes very gradually on the southern aspect, where the mountains maintain a comparatively regular descent from their summits to the ocean shore, a distance of 5 or 6 miles. Several long narrow valleys run up these slopes, along the sides and at the heads of which are many faces of columnar rock, over which leap the most romantic cascades. Again, the western portion of the range is narrow and precipitous.

"A number of detached hills and short ranges still further diversify the scene, more particularly the following. Midway between the Metalanim harbour and Aru point, there rises a very high hill, of perhaps 1000 feet, which sends westward a low prolongation that connects it with the main central range. Again, on the north of the island, in the Nut district, there rises a similar mountain, but barely connected with even the mainland. At this place the most perfect basaltic columns are found. The central ridge of Nut is but a prismatic mass, and about its base lie scattered columns of great length, also detached piles of agglutinated columns. This must have been, I think, at least one of the spots whence the materials for the Metalanim 'Ruins' were taken.

"By the course of the main range and the positions of the subsidiary hills, two broad and long valleys are formed. One of them may be called the Metalanim, the other the Nut valley. Each of them may be 4 to 5 miles in width, and 6 to 8 miles in length.

"There are several solitary projections of rock in the Metalanim and Kiti district. One, much resembling a sugarloaf in shape, in the Metalanim valley at the head of the harbour of the same name, is called **Takain**. Its height may be 400 feet, and its circumference at the base  $\frac{3}{4}$  of a mile. Its eastern aspects are perpendicular, its western, not so steep but that by adhering with hands and feet it may be ascended.

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\* Dr. L. H. GULICK on the Climate and Productions of Ponapi in SILLIMAN'S "Journal."

Adherent to the base of the main rock, yet separated from it above, is a much smaller rock. Within a quarter of a mile of Takain rises a dome-shaped hill, of almost the same elevation, but not so precipitous. At the head of the Panian harbour, a needle-shaped rock elevates itself from the top of a slight ridge. It may be 10 or 12 rods at the base, and perhaps 150 feet high above the top of the ridge; on LUTKE's chart it bears the name of mount *Guerite*, on the French chart *Boic*. In the west end of the island is another needle rock, much like mount *Guerite*.

"A number of very active streams pour through the valleys on the southern side of the island. The largest is probably that emptying at the base of Takain. On the north of the central range there are no streams, save one or two draining the Nut valley. These streams, during the course of ages, must have effected great things. I question whether any bodies of water in the world are more active than these. During freshets, which occur with almost every heavy shower, they are deeply perturbed by the black and red earths with which they are laden. These alluvial substances are deposited along the shores, forming in many places immense flats, over which the tide ebbs and flows. It is only on the south side of the island, from the Metalanin harbour to point Kittlitz, that these marshes are of any considerable extent, for on this side alone are the principal streams, and these south-west shores are protected from the roughened ocean acted upon by the north-east trades. The island at the mouth of the Nut valley is but one of the alluvial marshes.

"The insulated basaltic points about the main island of Ponapi are very interesting features of the group. *Mutok*, or Tenedos (as named by LUTKE), is in reality an island, being only attached to the main land by an extensive alluvial marsh. It is a sort of double hill rising very precipitously on its eastern aspect 150 or 200 feet. *Jekoits* island is an irregular triangle, each side being perhaps a mile and a half. Along the eastern border, running north and south, is a high ridge 800 or 1000 feet in height, exceedingly precipitous. The north-western part of the island is elevated from 150 to perhaps 250 or 300 feet, and along its northern and western shores presents very precipitous ascents. The columnar tendency may be seen in most of the ledges of this island, though perfect prisms are rare. *Lungur* and *Poitik* are but points of columnar basalt, 100 feet or so in height, with a *talus* about their bases, their circumference at the water's edge being perhaps half a mile. *Param* is about  $1\frac{1}{2}$  miles in length, and in one place half a mile in width, with a central ridge that may be at points 300 feet in height.

"The *Mantapeti*, or *Manta*, rise very abruptly from the water's edge: the smaller of the two is a sort of dome, though presenting in many places faces of perpendicular basalt; about its eastern shore are considerable hillocks of coarse conglomerate.

"The larger *Mant* is but the crest of a ridge of prismatic rock that along its whole western aspect presents a very precipitous face, and may be in one place 300 feet high. *Tapak* is but a repetition of the same, of less elevation. *Takain* rises with much of the usual perpendicularity to the height of perhaps 300 feet. The mass of its hill is of a reddish rock; and in certain spots a red earth is found that makes an admirable paint for native canoes; a substance that is also found in almost every part of the main island. *Mutokaloj* is about 50 feet in height, and is very small. Only on the margins of this islet have I succeeded in finding anything approaching to cellular

lava. **Taman** island has a general level of about 75 feet, and descends quite steeply to the water on nearly every side. Near it, to the south, are several very small and low basaltic islets.

"It need scarcely be remarked that the general surface of all the basaltic members of the Ponapi group is very rugged. Rocks and stones are scattered over almost the entire surface in the greatest profusion; and but few plains, even of a few acres in extent, are to be anywhere seen. The leeward slopes in the ~~Mita~~ district present a few spots that may be termed level. Basaltic specimens may be found on almost every square rod of the island, but on certain spots they seem to be adventitious rather than native. In such spots the earth is a reddish clay, under which will usually be found what seems to be a decomposed rock with frequent seams of red earth. Beneath the whole, we strike upon the substratum of basalt, in compact masses.

"My principal object of geological inquiry has been for positive evidences of what I suppose may be specifically termed *volcanic action*, viz., the products of volcanoes and craters themselves. About the eastern shore of Mantapeti we find a conglomerate, which I presume I am right in supposing attributable to volcanic action. So also at Shelong. About Mutokaloj I find scoriaceous lava. But as yet I have not been able to fix my eye on anything which in my ignorance I can recognise as a crater. Several of the hills have at a little distance, clothed as they are with luxuriant vegetation, that regular dome or cone-shaped contour which I suppose one feature or variety of isolated craters; but, on close inspection, faces of perpendicular basalt may almost always be found, which, with the absence of terminal bowls, is I presume decisive against their being craters. The Rev. Mr. DOANE has called my attention to the appearance of the eastern terminus of the central range. The very end or point of the hills, just as they reach the shore opposite to the Mant islands, seems as though removed by a gorge, leaving a semicircular area, with steep sides, in some places 150 or 200 feet high. May this be a crater with one part of its periphery destroyed, or is it only an accidental termination? The certain detection of craters must be left for my future study, or for better instructed investigators.

"Surrounding the whole body of basaltic elevations is a beautiful coral reef, distant from the coast of the main island the average distance of perhaps 2 miles. There are no less than *seven considerable intervals in the continuity of this reef, forming as many harbours, several of which are really excellent*. Between the reef and the shore of the island are all the usual coral patches that give such wondrous variety to tropical waters. The height of these patches varies greatly. A very considerable number of them are from an inch or two to a foot or more above the ebb tides at syzygies. On the outer reef are a number of islets in every respect similar to those on the purely coralline groups. They are found from the mouth of the Metalanim harbour, along the southern line, as far as point Kittlitz, but not on the north of Ponapi. These islets have a nearly uniform elevation of about two feet above high water mark. I gather from my own observations and from the reports of the pilots, that soundings are found outside of the reef, nearly if not quite round the island, at distances varying from a quarter to half a mile from the reef.

"Mr. HALE, philologist of the U.S. Expl. Exped. under Com. WILKES, has

advanced the supposition that Ponapi, in common with Kusaie (also called Ualan and Strong Island) and other Caroline islands, has undergone a depression of several feet within a few centuries, that is, since the erection of the celebrated 'Ruins' near the Metalanim harbour. Were Mr. HALE's suppositions regarding the original position of the ruins on dry land correct, the evidence would be decisive of an important subsidence within a comparatively recent period. But I am well satisfied the structures maintain very nearly, if not exactly, the same relation to the ocean they did on their first erection. There is not, that I find, any evidence of accumulating sands about their bases, as would be the case had there been a subsidence. And again, the habits of the people would lead them to select just such a submerged position for the easier ingress and egress of their canoes, to which they are so attached as vehicles of travel. That Mr. HALE should have suggested this hypothesis is not surprising considering the reports he had received. A personal inspection would, without doubt, have influenced his mind as it has that of every intelligent observer. In my remarks on this topic I do not overlook the fact that the coral island regions are, in general, areas undergoing depression. The investigations of Mr. DARWIN, with the further illustrations of Mr. DANA, are decisive on this point. I only question the supposition of any subsidence since the erection of those structures we denominate 'the ruins.' In this connection I may mention the tradition that there once existed a small islet at the mouth of the Metalanim harbour, to the north of the entrance, which had trees on it, but which no longer exists, having been carried away by a great wave in the days of the grandfathers of the present generation. Such little changes are continually taking place, one islet being formed at the expense of another. They are, I think, not at all indicative of subsidence. Earthquakes are unknown in Ponapi.

"*Climate*.—No island of the whole range, not even of Micronesia (which includes the Gilbert, Marshall, Caroline, and Mariana Islands), has yet been made a point for accurate meteorological observations, which will enhance the value of records on Ponapi.

"The following meteorological averages, deduced by Mrs. GULICK from her daily observations, extending through a period of three years, 1853-54-55, will speak for themselves of the more important topics connected with climate. It is to be regretted that the want of necessary appliances has rendered these observations much less extensive through the whole field of meteorology than we would gladly have made them.

"*Average for 1853*: Temperature, Fahr. Therm.:—Mean at sunrise,  $76^{\circ}90$ ; mean at noon,  $83^{\circ}81$ ; mean at sunset,  $78^{\circ}56$ ; maximum,  $89^{\circ}$ ; minimum,  $70^{\circ}$ ; range,  $19^{\circ}$ ; mean,  $79^{\circ}75$ .

"*Weather*.—Number of clear days, 96; showery days, 155; rainy days, 72.

"*Electrical Phenomena*.—7 days with thunder, 5 days with thunder and lightning.

"*Average for 1854*: Temperature, Fahr. Therm.:—Mean at sunrise,  $79^{\circ}17$ ; mean at noon,  $82^{\circ}81$ ; mean at sunset,  $79^{\circ}54$ ; maximum,  $86^{\circ}90$ ; minimum,  $74^{\circ}48$ ; range,  $11^{\circ}52$ ; mean,  $80^{\circ}50$ .

"*Weather*.—Number of clear days, 97; days with a slight sprinkle, 42; showery days, 174; rainy days, 23.

" *Winds*.—N.E. trades, 239 days; variable winds, 98 days; calm, 26 days.

" *Electrical Phenomena*.—Thunder 9 days, 3 with lightning.

" *Average for 1855*: Temperature, Fahr. Therin.:—Mean at sunrise,  $78^{\circ}78$ ; mean at noon,  $83^{\circ}33$ ; mean at sunset,  $79^{\circ}73$ ; maximum,  $87^{\circ}98$ ; minimum,  $73^{\circ}76$ ; range,  $12^{\circ}78$ ; mean,  $80^{\circ}61$ .

" *Weather*.—Number of clear days, 139; days with a slight sprinkle, 32; showery days, 118; rainy days, 35.

" *Electrical Phenomena*.—Thunder 7 days.

" *Average for Three Years*: Temperature:—Mean at sunrise,  $78^{\circ}28$ ; mean at noon,  $83^{\circ}31$ ; mean at sunset,  $79^{\circ}27$ ; maximum,  $89^{\circ}$ ; minimum,  $70^{\circ}$ ; range,  $19^{\circ}$ ; mean,  $80^{\circ}28$ .

"There are few who will not remark the astonishing uniformity of temperature exhibited in the preceding summary. It is to be questioned whether there exists a series of observations exhibiting as great a uniformity in any part of our globe. The South Seas, generally notorious as they are for salubrious equability of temperature, have probably not yet presented anything equal to this.

"The mean daily range is about  $5^{\circ}$ .

"The mean difference of successive days is about  $1^{\circ}$ .

"The utmost range of the thermometer, during three years, was from  $89^{\circ}$  to  $70^{\circ}$  only  $19^{\circ}$ .

"The mean temperature of three years was  $80^{\circ}28$ .

"It should be remarked that the observations till May, 1853, were made in a most peculiarly unfavourable locality, which greatly exaggerated and distorted the thermometric conditions. The remaining observations were made from a locality such as would always be sought for a residence, and will without the slightest difficulty be found in every part of Ponapi. By these it appears that the yearly mean is about  $80^{\circ}50$ ; the utmost range about  $12^{\circ}$ ; the mean at 7 A.M., about  $78^{\circ}$ ; at noon, about  $85^{\circ}$ ; and at 9 P.M., about  $79^{\circ}50$ .

"Facts to be stated in connection with remarks on the winds and weather, will sufficiently account for this singular equability, particularly when it is remembered what an immense expanse of ocean surrounds all these Micronesian islands.

" *Winds*.—The predominating winds are the N.E. trades. During the northern winter, while the sun is in southern declination, and while, consequently, the whole system of aerial currents is drawn to the South, the island is fully exposed to their action. This period usually lasts from December to May, inclusive; though there is much difference in different seasons. At times, the trades do not set in till January, and, again, they begin to blow steadily as early as November, and they cease blowing at any period from April to June. There are certain seasons when they are but faint, even during the dead of winter, as in January and February, 1856; and, again, they may continually intrude themselves during all the summer, as in 1856.

"The following Table shows the distribution of the winds in the different months of 1854:—

Months.	Days of Trade-wind.	Days of Variables.	Calm days.	Months.	Days of Trade-wind.	Days of Variables.	Calm days.
January ...	29	2		July.....	11	11	9
February...	28			August ...	7	24	
March .....	23	8		September..	11	16	3
April .....	29	1		October ...	6	10	14
May.....	29	2		November ..	15	15	
June .....	22	8		December...	29	1	

"*Currents.*—During the period when the N.E. trade is freshest, strong westerly currents are generally experienced. From the middle of August to the middle of November, when strong westerly winds, with heavy squalls, may be expected, strong easterly currents prevail.

"*Gales.*—It may be remarked that the severer class of gales are comparatively unknown here. The *typhoons* of the China Sea, and even of the seas north of the *Marianas*, about the Bonin islands, rarely (if ever) extend to this island. Yet once, during the youth of a few of the very oldest inhabitants now living, a desolating wind swept over the island, so tearing up the bread-fruit trees—the principal reliance for food—that an awful famine ensued, and large numbers died. It would seem possible that this was a cyclone. And it is very interesting that a similar gale produced similar results at Kusaie, or Strong island, five degrees east of Ponapi, and that, too, in the memory of the very oldest inhabitants. May not this have been the very same erratic cyclone that swept Ponapi?

"*Weather.*—Without being able to give accurate udometric figures, the observations recorded regarding the general character of the days exhibit the fact that there is much humidity, though nothing excessive. Situated just on the southern confines of the N.E. trades, and under the northern edge of the cloud zone that hovers over the equatorial regions between the two trade wind zones of the North and South hemispheres, the island is constantly exposed to precipitations from above. Before the trade winds reach the island, they have made their passage over thousands of miles of ocean, and have become saturated with moisture; so that, as soon as they impinge on the central elevations of the island, some of which are 2858 feet in height, the clouds are arrested and showers fall; and, as the island is but little more than fifteen miles in diameter, they readily pass over them and water the lee no less than the windward slopes. And again, during the summer, while the trades have receded northwards, we are, ever and anon, shaded by the equatorial clouds, which pour their contents most bounteously; yet we are constantly so near the northern boundary of this zone, that we do not experience its severer, its protracted and unpleasant

pouring rains of weeks and months. The humidity is consequently more equably distributed through the year than in most tropical regions: yet we speak of the summer as the season most rainy, if not as the 'rainy season.' It must be remarked, however, that the year, 1856, during which the trades were very faint through all their usual months, and were quite intrusive through all the months during which they usually absent themselves, was the most dry remembered by the oldest inhabitants.

"Of the *electric phenomena*, I can only report that thunder is rare and lightning still rarer. Thunder was heard only twenty-eight days in three years, and lightning seen only eight days. So very seldom does lightning prove destructive, that the natives have never suspected its agency, but attribute the results to a direct visitation from their *Ani* or Spirits, the only gods they reverence.

"*Vegetation*.—The island must once have been a dreary waste of rock, but the processes of decomposition have mellowed large portions of the surface, and thus changes have been wrought full of scientific interest and poetic beauty. Short, rapid streams are active in forming alluvial deposits round the shores of the whole island, where the coral reef, like a silver plate containing the emerald gem, most conservatively preserves the precious *débris*,—a rich source of vegetable wealth. Openings in the outer reef are frequent, by which several excellent harbours are formed.

"Except on its northern aspects, where the scattered islands and the bold hills are delightfully picturesque, there is nothing marked about the landscape, yet all is warm with a beauty most serene. The mainland shore steps freely, gracefully down to where ocean ebbs and flows. Between the ever-green shore and the outer reef many a patch of coral whitens near the surface, though not protruding, save at lowest tide, and attracts the eye to tracing the winding channels and spreading bays of the deeper blue. All along the outer reef the foaming line of white shows where hoary ocean casts up, as tributes of love, many a deep sea gem, and where he is ever surging out his admiration of Nature and his anthem to Nature's God.

"Ponapi is clothed with vegetation from its highest peaks quite into the ocean, where extensive mangrove swamps flourish in perfection. So dense is the vegetation that a passing vessel can scarcely discern a house of the hundreds that are scattered around its entire circumference; and but for the smoke of domestic fires, and the canoes gliding with paddle and magic sail within the encircling reef, the island might readily be thought uninhabited. The whole surface of the island is covered by an uninterrupted forest, with the exception of a few spots on the leeward slopes covered with a short coarse grass, whose green is of quite a yellow cast, and contrasts strongly with the intensely deep, almost black, green of the surrounding thickets.

"This luxury of vegetation gives a peculiar softness to the scenery. The absolute uniformity of the unbroken sultry green detracts perhaps from its picturesque romance to a widely-travelled eye; though to one with a purely Micronesian eye and heart it is the highest type of island beauty. Nor does the uniformity pertain only to colour; even the circumstances of varying height and form are apparently denied to the different tribes of trees, so completely does the mantling canopy of vines bind tree to tree, bridge every slight hiatus, and blend every peculiarity in one gently undulating flood. With the exception of two or three varieties of palm that

occasionally skirt the shore, like the cocoa-nut, or stand in princely distinctness like the sago, nothing in form or altitude relieves the luxuriant scene.

"The growths of heavy timber are by no means confined to the dry land, but extend far out on to the coral flats, there forming very extensive *mangrove* swamps, as on the N.E., east, and S.E. sides of the island. The area of these swamps is yearly extending; the intervening spaces between different patches, that form so many creek-like passages, being continually lessened; and the outer coral flats are becoming more and more green. There are several representatives of the family *Aroidæ*. Varieties of the *Arum esculentum* grow wild, but are much inferior to the *taro* of the Hawaiian islands. The natives distinguish no less than six varieties of *Saccharum*—one very similar to the kind that makes the best sugar in Mauritius. The genus *Pandanus*, which furnishes the material for thatching, is represented by two varieties—one yielding a fruit, pulpy, sweet, and no doubt highly nutritious, and, to one accustomed to it, certainly quite as palatable as sugar-cane. The *Dioscorea* (yam) is extensively cultivated, and there are several indigenous varieties—some growing wild.

"Of the *cocos nucifera* (cocoa-nut) there are eight or ten varieties; they thrive wherever planted, though the usual localities are along the shores and on the coral islets. The leaves of what must I think be a species of the *Sagus* (sago) are used for thatching; it is found in moist localities, stands perfectly erect, and spreads its magnificent tuft at the maximum height of perhaps 75 feet. A plant very nearly allied to the *Areca catechu*, if not indeed the genuine betel nut, is occasionally to be seen; the natives frequently chew the unprepared nut, but never combine it with lime and betel leaves, as in the East Indies, and as even on an island so near as Eap. A species of *Tacca* is scattered about the island, and is peculiarly abundant on the Ant group; it might be made a considerable article of export. The genus *Zingiber* has at least one representative. Of the *Musa* (banana) there are many varieties—neither Malabar nor Sumatra can boast of more. At least one variety of *Lauraceæ* is found. The *Piper methysticum* grows luxuriantly and is assiduously cultivated; the natives make most extravagant use of it as a narcotic beverage.

"The *Artocarpus* (bread-fruit) is the great food-producing genus to the inhabitants of Ponapi: without it they would starve, or be reduced to the dire necessity of slight labour for their sustenance; with it, no lords of creation are more independent. It forms very extensive groves, even forests; it is cultivated with all the little care it requires, and also grows wild over every portion of the island. The months of the northern summer are those during which the greatest harvest is gathered; there is another slight crop in the winter or trade-wind season, and scattered trees may be found bearing during every month of the year. The crop is a somewhat uncertain one; the same trees seldom bear well two successive seasons; and an excess of moisture, as well as drought, very sensibly affects it.

"The *Mangifera* has one representative in a tree that bears a fruit certainly not unpalatable on an island so destitute of tart fruits, but which is quite fibrous, and not to be compared to the *Mango Indica*. One plant of the genus *Citrus* grows wild; the fruit is about 2½ inches in diameter, the rind thick and bitter, and the interior coarse and dry.

"*Animals*.—*Dogs, rats, and bats* are numerous. Of *birds* there are twenty-nine

or thirty species—among them a partially domesticated *fowl*, a *pigeon* and *dove*, a *plover*, a *sand-piper*, a *sea-duck*, &c. *Insects* are somewhat numerous, but distributed through a comparatively small number of genera: a *white ant* is troublesome; *mosquitoes* are bred by myriads in the swamps. A few varieties of *spiders* are found, and also a small scorpion. The *Crustacea* and *Mollusca* are numerous and attractive. Of *Radiata*, the waters are alive with them: ten or twelve species of *Holothuria* (*biche de mer*) are found. Whales and porpoises are comparatively abundant in the surrounding seas. Two species of *turtle* frequent the waters and visit the Ant group to deposit their eggs; 'tortoise-shell' forms an export of some value. There are several species of *Lizards*. I need scarcely remark that the varieties of *fish* are very numerous. *Pigs* have been introduced by Europeans.

"The *Natives*.—The hair of the Ponapian is jet black, generally quite straight, but often somewhat curly, and occasionally very much so. His skin is that which I should think is properly called copper-coloured. It may be of a slightly lighter shade than is the prevalent one through Polynesia, but M. LESSON's term 'citron-yellow' is too strong either for the inhabitants of this island or of the other Micronesian groups; though, when protected, the complexion does indeed lose its deeper tints, as is also true of all the Malays—Polynesian races. And, to complete the parallel, there are individuals, born before the discovery of the islands, and not in the slightest degree more exposed than the mass, whose skin is so very much darker as to suggest the possibility of a negritic infusion from the large Melanesian islands so few degrees to the south. I cannot think these varieties of tints anything more, however, than that which is always found in the different members of almost every race, and particularly those of the Pelagian family.

"In stature, the Ponapian is slightly below the European average, which comes, as in the New Zealander, from a shortening of the leg. There are many large, strongly built men, but the prevailing type is that of wiry agility. I think it probable that the size of the males, in particular, is decreasing from contact with civilization.

"The cerebral developments are good. There is something pleasing in the general cast of their countenances. The jet black eye, the regularly formed face—but slightly broader than with ourselves; the nose somewhat heavy, low, and coarse, though but seldom repulsive; the perfect teeth; and the small delicately-attached ear, save when artificially deformed, is the portrait of an islander possessed of more than usual attractiveness and intelligence.

"The mental characteristics of this people are as favourable as their physical. Like their bodies, their minds are more quick and sprightly than strong and forcible. There is very little of that stolidity so frequent among the degraded races, and very little of that power found among others. Their temperament is mercurial. In matters of any interest at all to them they readily acquire knowledge—as, for instance, the acquisition of the English language. Very many of them are quite familiar with that sailor's 'lingo,' which is almost the only one they have heard. Those few individuals who have been to sea are among the very quickest of islanders in picking up facts and making themselves useful. They are usually favourites wherever they go abroad from their native island.

"It is hardly just to decide upon the full power of the native mind from the generation now on the stage, so greatly has it been deteriorated from contact with the

civilized world during now nearly thirty years. Being so small a body of people, they have very severely felt the full stream of foreign contaminations, and have not had the requisite vigour for re-acting under it. The process of decay has been very marked during late years. Occasionally, even now, exhibitions are, however, made of no contemptible power and ingenuity; but it is an evidence from former times that is conclusive of no mean measure of enterprise and ability.

"The largest of their present canoes will carry from ten to fifteen men, but during the generation before their discovery their larger craft as well deserved the name of *proas* as do those now made at the Marshall and the western Caroline islands. There still remain a few fine specimens of native architecture in a large feast-house and a royal dwelling or two; and the finish of very many of their houses speaks of more than ordinary nicety and mechanical resource; but the exhibitions in this line are very much less remarkable than formerly, both in magnitude and finish. An examination of the noted so-called 'ruins' on Ponapi amply demonstrates that this people had originally no slight measure of laborious energy; and the voyages they once performed to Mokil, Pingelap, Ngatik, and perhaps even to Kusaie, tell of bold nautical knowledge and enterprise not a whit behind that of any of the Micronesians.

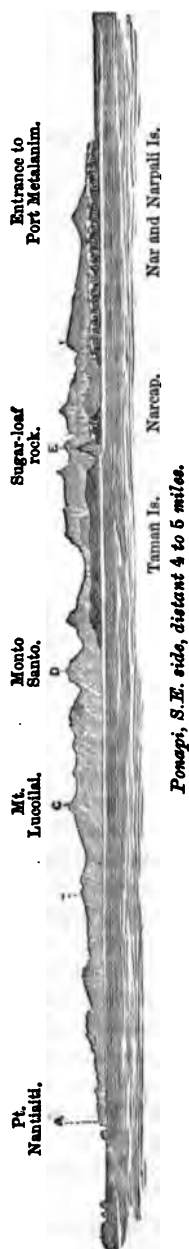
"Morally, the Ponapian has many pleasing characteristics, though dashed by defects and obliquities that indubitably establish his moral unity with the human family in other zones. It may quite safely be said they are destitute of pure moral principle. When truthful, honest, and virtuous, it is because present interest constrains; and generally the strongest of even present interests will not secure such high-principled action. Their minds have but the smallest traces of that magnanimity so often the attribute of savages. Liberality in sharing food is forced upon them by Nature's liberality in giving it; but in little else is generosity seen. Gifts are, it is true, constantly made with great prodigality; but they are either semi-forced contributions to a superior, or even larger returns are without fail to be expected. There is a something which might be hastily termed transparent candour and openness of character, incapable of deep, dark crimes, necessitating concealment; but that they cannot keep secrets comes from a want of mental character sufficient to retain them. All seems loosely bound, and a secret escapes simply because there is no mode of detaining it. They are affectionate and kind within the bonds of close relationship; but outside of it their hearts are in general as callous as those of the so-called civilized world that visits them, from whom they have learned to be especially unkind and unsympathizing to all foreigners. Their minds are extremely prone to suspiciousness and displeasure; but there seems to be no basis for the darker shades of sullen moroseness, and consequently they are placable, and their alienations are healed with comparative ease, only however to disengage the mind for other frivolous contentions. Seldom do we hear of ferocious revenge, but the art of contriving adroit slights and insults is carried on to very considerable perfection. The Malayan trait of deception is carried on as far as their loose characters permit. They might be termed a cheerful people, agitated by no fervent passions, but there is a constant simmering of low intrigue and jealousy through every grade of their limited society that as effectually destroys the exuberant effervescence of pleasure as of deeper passion."

The population of Ponapi amounts to about 5000, and the villages are situated on the coast.

**Kiti, or Rono-Kiti harbour.**—Off the S.W. end of Ponapi are three small islets:—the westernmost,  $2\frac{1}{2}$  cables long (N. and S.), and wooded, is named **Nalap**, or **Warlap**; to the northward of it is a smaller islet, also wooded, called **Shanlak**, but by whalers Little Nalap. To the eastward of Nalap, distant rather more than  $\frac{1}{2}$  a mile, is a small sandy islet with bushes on it, named Namaur, or Narmaur. Between Nalap and Namaur is a break in the coral reef, and this leads to Kiti harbour. It was surveyed by the officers of H.M.S. *Larne* in 1839, and the instructions are:—"After passing an outer bight or bay, formed by the outer reefs, in which there is nothing less than 45 fathoms, a N.W. course leads for the inner passage, which, for about 200 yards, is 80 yards wide, between a sunken rock (with 4 feet on it) on the port hand, and the line of the inner reef, very steep-to (7 fathoms), which should be hugged as close as possible. The course through the Narrows is N.W. by W., but a fixed course is unnecessary, as a ship would always pass in and out, as the *Larne* did, by the deep water as distinguished by the eye when conned from the fore-topgallant mast head. The ordinary N.E. trade is a leading wind in, with very smooth water, and when through the Narrows, it is requisite, if possible, to shoot to starboard round the tongue of the reef, clewing all up, and anchor in 22 fathoms. Then warp to northward up the pool to any depth, from 20 to 7 fathoms, which it is best to do evening or morning when the wind drops. It is also advisable to warp in and out through the Narrows, for though the N.E. trade leads both ways, a flaw in the wind would cast the vessel on the lee bank of steep and ragged coral."

Capt. CHEYNE says Kiti harbour "forms a snug basin where a ship can lie as safe as in a dock. The entrance however is narrow and intricate, the Narrows, for about 200 yards, being only 8 yards wide. The outer entrance is between the wooded island of Nalap and the sandy islet of Namaur with bushes on it, situated on the reef, eastward of the former. The channel is 4 cables wide. The distance from the entrance to the Narrows is nearly a mile, north and south (true) midchannel. In entering, the elbow of the barrier reef (to the southward of the sandy islet) should have a berth of  $1\frac{1}{2}$  cables, as a coral spit extends from it some distance. In the middle of the outer bight or harbour the depth is 45 fathoms, decreasing gradually towards the Narrows, where it ranges from 10 to 15. A detached sunken rock, with only 4 feet on it, lies in the outer entrance of the Narrows. This must be left on the port hand going in. The course through the Narrows is N.W.  $\frac{1}{2}$  W. (true). When inside, the water deepens to 20 and 25 fathoms, and then gradually shoals to the anchorage at the head of the basin. The harbour or basin is 7 cables in length N. by E. and S. by W. (true); and between the narrowest part of the reefs which form it,  $1\frac{1}{2}$  cables wide. The best anchorage is at its head, in 7 or 8 fathoms, where the port has a diameter of two cables without going under 5 fathoms. The reefs forming this harbour dry on each side and at the head of the basin, at low water springs."

It is better not to attempt the harbour without a pilot; and an European can always be found for this purpose.



The entrance to Kiti river, where abundance of excellent wood and water can be procured, is about  $\frac{1}{4}$  of a mile from the head of the harbour. The river is a fine stream of good water, but boats can enter only an hour before high water.

All the coast-line is a mangrove jungle.

*High water* at F. and C., from 3h. to 4h.; rise 6 feet.

*Position*.—Namaur islet, on the east side of entrance to Kiti harbour is in lat.  $6^{\circ} 47' N.$ , long.  $158^{\circ} 17' E.$ \*

**Port Mutok** or **Panian harbour** is on the south side of Ponapi, opposite the island of Mutok and Mount Tenedos of LUTKE. One entrance, on the east side of Panian islet (lat.  $6^{\circ} 45\frac{1}{2}' N.$ ), and  $7\frac{1}{2}$  miles eastward of the entrance to Kiti harbour, shows upwards of 19 fathoms; it is probable that there is also another entrance to it, between 2 or 3 miles westward of Panian islet: but nothing is known of the upper part of the harbour.

**Port Lod** is a small harbour near the S.E. end of Ponapi; the entrance is through a break in the reef in lat.  $6^{\circ} 47\frac{1}{2}' N.$ , and  $1\frac{1}{2}$  miles N.E.-ward of point Nantiaiti,—between two islets, the southernmost of which is called Bunatik, and the northern one, Narancpuli. The depths decrease from 19 fathoms at entrance to  $4\frac{1}{2}$  fathoms at the head of the harbour; vessels usually anchor opposite the mangroves that front the shore. It is now much used by whalers, on account of their being able to sail in and out with the prevailing N.E. wind.

**Metalanim harbour** is on the east side of Ponapi; the entrance, in lat.  $6^{\circ} 52' N.$ , is to the northward of Nar and Narpali islets. The anchorage is from  $1\frac{1}{2}$  to 2 miles inside the entrance; but the channel is contracted by sunken rocks; and as it fronts N.E. the wind blows right in with a heavy swell, rendering it not only difficult, but dangerous to get out: it is dangerous to beat out as the wind may drop, and boats are useless in towing against the swell; the *Falcon* whaler was wrecked in attempting to beat out in 1836, after having been three months wind-bound inside. No square-rigged vessel of any magnitude should enter here.

\* LUTKE's chart places Namaur islet in long.  $158^{\circ} 19'$ ,—H.M.S. *Larne* in long.  $158^{\circ} 28'$ ;—the French corvette *La Danaïde* made the long. of Port Metalanim  $158^{\circ} 16'$ , which being  $10'$  E. of Namaur islet places the latter in long.  $158^{\circ} 8'$ ;—the mean of these is the longitude given in the text above, and it closely corresponds to the position given on the French Chart of the *CAROLINES* No. 1152 corrected to 1869.

The harbour is formed by the main land of Ponapi, and is in the form of a horse-shoe. It may easily be known by a remarkable spire-like, or sugar-loaf rock situated on the north shore, within the harbour. The depth at entrance is about 35 to 40 fathoms.

Capt. S. G. MOORE of the missionary packet *Morning Star* speaking of this harbour in Sept. and Oct. 1858, says: "It being calm and the tide favouring, I gave orders for getting under way. We weighed anchor and sent a boat a-head to tow. Taking the lead I commenced sounding my way along; 10 fathoms—10 fathoms every heave. In a little while I perceived the vessel had no headway. Supposing the tide had turned, I called out 'Pull a-head boys, or we shall be obliged to let go again.' The mate, looking over the side, thought he saw bottom. Taking the lead over to the other side, instead of 10 fathoms, we found 5 feet; the reef being perpendicular, and the vessel lying as if alongside a wharf. Taking out a kedge we hauled her away, and she drifted along out." And again, on coming out of Metalanim harbour on another occasion he says: "The more experience I have in navigating these seas, the more I become convinced of the necessity of extreme caution on the part of those who have the management of vessels here. During my absence Dr. GULICK had surveyed the reefs in the outer harbour, and planted limbs of trees on the extreme points. After we had weighed anchor I sent a boat ahead to tow, it being calm, and, with the tide in our favour, we swept along at about 2 knots. Being aloft to look out for the landmarks, I saw we were going all clear of them on our starboard bow, but the sun being directly ahead I could not see a reef till Dr. GULICK made me aware of it from the boat. I immediately gave him orders to pull around to port. The vessel, swinging with the tide, came on the reef, and had she struck a rock it might have damaged her seriously. This reef had escaped Dr. GULICK's notice, and not only he, but an old native, who was on board, did not seem to be aware of it. These reefs spring up from great depth, and there is no such thing as safety, day or night, without extreme caution. On coming round from Kiti harbour, where, according to all I had heard or read, no dangers existed, I looked over the side and saw bottom just in time to haul off. The reefs are sometimes perpendicular, and then, again, when you would suppose them to be barrier reefs, they take the form of fringing reefs, and shoal water extends a great way out. The discoloration of the water is but little criterion of danger either, for the clouds will frequently produce a deceptive appearance."

**Jecoits harbour**, on the north coast fronting the island of Jecoits, is 2 cables wide, but the water inside is very deep, and a heavy swell frequently sets into the passage.

There are a few more openings through the reef, in other parts of the island, leading to good anchorages inside, but they are not places to which whalers resort. Off the N.E. side are **Aru harbour** in lat.  $6^{\circ} 56' N.$ , and **Mants harbour** in lat.  $7^{\circ} 0\frac{1}{2}' N.$  On the West coast (near the centre) is **Tahuak harbour**, in lat.  $6^{\circ} 54\frac{1}{4}' N.$ , south of the two coral islets named Tahuak.

*Supplies* of water, poultry, pigs, tropical fruits, wood, &c., can be procured at any of the harbours.

The reef can be approached anywhere within half a mile, as there are no outlying dangers. The edge of the reef extends from the land much further on the north and

N.W. sides than elsewhere,—in some places being  $2\frac{1}{2}$  to 3 miles off at least. The N. extremity of the reef is in lat.  $7^{\circ} 3\frac{1}{2}'$  N., long.  $158^{\circ} 23\frac{1}{2}'$  E.

**MOKIL.**—This group was examined by DUPERREY in *La Coquille* in 1824, and hence received the name of **Duperrey** islands: traders in the Pacific frequently call it **Wellington** isles.

The group consists of a reef (on which are three low coral islands) extending three miles N.E. by N. and S.W. by S., and varying from 1 to  $1\frac{1}{2}$  miles in width,—the whole enclosing a lagoon, into which there is no ship passage, although it has been stated that on the N.W. side such a channel exists. The N.E. and largest island is named **Mokil** (the Mugul of DUPERREY); the south island, *Aura*,—and the N.W. or smallest, *Ugai*. The reef extends on an average from  $\frac{1}{4}$  to  $\frac{1}{2}$  a mile outside the islands, but  $\frac{1}{3}$  of a mile off the N.E. point.



*Mokil Islands.*—*Aura* (A) bearing N.  $80^{\circ}$  E. (true), dist. 1 mile. (Duperrey.)

The islands are covered with cocoa-nut trees, and the natives number about 80, who are unarmed, quiet, and inoffensive. In 1853 they were completely under the control of an American named Lucien Huntington, and an Englishman named James Walker. Capt. HAMMET, H.M.S. *Serpent*, called there, when passing in 1853; he purchased "hogs, fowls, turtle, and *taro*, at a reasonable price; the only wood is the cocoa-nut tree, and there is no other but rain water. There is a flagstaff close to Huntington's house, on which he hoists a flag to attract passing ships." The reefs produce *biche-de-mer*. More recently the natives were under the guidance of a Massachusetts man named Higgins, and cocoa-nut oil was manufactured to some extent. The group abounds in turtle.

*Position.*—Centre of reef (which coincides with S. extreme of Mokil island), lat.  $6^{\circ} 39'$  N., long.  $159^{\circ} 49'$  E.

**PINGELAP.**—This group is supposed to have been discovered by Capt. MUSGRAVE, of the *Sugar-cane*, in 1793, but misplaced in long.  $1^{\circ} 33'$  too far west; it was seen by Capt. MACASKILL, of the E.I. Co. ship, *Lady Barlow*, in 1809, bound from Port Jackson to China, and hence called **MacAskill** isles; DUPERREY examined it in 1824.

The group consists of two low coral islands and a small islet, on a reef extending  $2\frac{1}{2}$  miles N. by W. and S. by E., and barely 2 miles W.S.W. and E.N.E.,—the whole enclosing a lagoon into which are several boat passages at high water. The



*Pingelap Islands.*—*Tugulu* (A) bearing S.  $60^{\circ}$  E. (true), dist. 1 mile. (Duperrey.)

south-eastern and largest island is **Pingelap** (or Pélélap of DUPERREY),—the northernmost island, Tugulu,—close to which, on the west side of the reef, is the islet Takai. The islands are larger than those of the Mokil group. The reef does not extend more than  $\frac{1}{4}$  of a mile outside the islands, except at the N., S., E.N.E., and W.S.W. angles of the reef, where the extension is about  $\frac{1}{2}$  a mile. There is no good ship passage (as has been reported) into the lagoon on the west side, nor in any other part. The islands are well wooded with cocoa-nut trees; and they contain about 300 inhabitants, who are a light-complexioned, fine race, armed with spears, and would resent any injury or injustice. The natives have some good canoes. Fowls and cocoa-nuts can be obtained: but no water except rain-water. The reefs produce *biche-de-mer*.

*Position*.—The N. point of Tugulu (the northernmost island) is in lat.  $6^{\circ} 14' 25''$  N., long.  $160^{\circ} 47' 50''$  E.; and the S. point of Pingelap (the southernmost island) is in lat.  $6^{\circ} 12' 40''$  N., long.  $160^{\circ} 48'$  E.

*Four small, low, and inhabited islands*, reported by the brig *Cyrus*, and stated to be in lat.  $5^{\circ} 40'$  N., long.  $161^{\circ} 8'$  E., are unknown in that position. It is possible a mistake was made in the report,—by changing S. to N. lat., in which case they would be some outlying members of the Ontong Java or Lord Howe islets, upwards of thirty in number,—wooded and inhabited. The *Cyrus* communicated with the natives, though only by boats.

**KUSAIE** or **UALAN**.—This is another of the high basaltic islands of the Carolines, and the easternmost of the Archipelago. Whether it was visited by any of the early navigators is not known, and the natives have no traditions to that effect. In 1804 Capt. CROZIER, commanding an American ship, announced its discovery under the name of **Strong island**,—so called after the governor of Massachusetts. It was visited by DUPERREY, in the *Coquille*, and the coast surveyed, in 1824; and subsequently D'URVILLE called there, as did LUTKE in 1828, the latter giving a very good description of the island and people. At different times between 1835 and 1842, the *Waverley*, *Honduras*, *Henrietta* and *Harriet*—trading schooners and whalers—were cut off, the crews murdered, and the vessels burnt; but, according to the native account, only by way of reprisal for ravishing daughters and wives, and detaining them on board.

Kusaie, with its fringing reef, is  $7\frac{1}{2}$  miles long (N. and S.), and  $8\frac{1}{2}$  miles wide (E. and W.),—the reef, which nowhere extends far beyond the coastline, being 30 miles in circumference. Its whole aspect is hilly, and towards the centre mountainous. In the north, mount Buache attains an elevation of 1912 feet according to DUPERREY, or of 2152 feet according to LUTKE; from its rounded summit the sides slope gradually to the base. Near the centre of the island is mount Crozier, which DUPERREY made 2155 feet high, but LUTKE only 2020 feet,—the north flank is bold and rugged; the crest of this range runs east and west, and on it are other peaks from 1400 to 1800 feet high. The detached peak with the regular conical summit, on the N.W. side of the island and behind Coquille harbour, is named after the naturalist that accompanied LUTKE on his voyage, Mertens' monument, and is 1740 feet high. A break in the mountain mass between mounts

Buache and Crozier extends from west to east, across the island, dividing it into two unequal parts, of which the southernmost portion is double the size of the northern one. A coral reef fringes the N.W., north, and N.E. sides of Kusaie, which, opening opposite the break in the mountains, forms a harbour on the N.W. and N.E. sides of the island,—that on the N.W. side being Coquille, Lee, or West harbour, and in which both DUPERRÉ and LUTKE brought up,—that on the N.E. side is named Lela by DUPERRÉ after the small island which shelters it to the northward, but the natives call it Nin-molchon.

The south part of Kusaie is surrounded by a chain of coral islets, connected by a reef, and forming a narrow shallow channel inside, which can be traversed by boats. Near the centre of the south side this coral chain is broken, and forms a small harbour, called Lottin by DUPERRÉ.

The whole island from the sea to the mountain tops, with the exception of the highest and most peaked summits of mount Crozier, is covered with a thick and almost impassable forest. The shores, sheltered by the reef from the violence of the waves, are surrounded by a broad belt of mangroves and other trees, forming a thick wall of verdure which soon fatigues the sight from its monotony, and also hides the real limits of the island. The valley (between mounts Buache and Crozier) at each extremity of which is a harbour (as already mentioned) affords the only passage by which the island can be crossed from side to side. Rivulets and small streams of water are everywhere very abundant, and the climate is generally moist, but apparently not unhealthy.



*Kusaie.—Crozier peak (A) bearing S.E. (true), dist. 8 miles.*

All the villages, of which LUTKE enumerates fifty, are situated near the coast, amongst cocoa-nut, bread-fruit, banana, and other fruit trees, but few are visible from seaward, being hidden by the coral islets or the mass of mangroves. The island contains about 700 inhabitants, who are ruled by a king, whose power is absolute; but he is assisted by the superior chiefs, who alone are entitled to hold land. The present sovereign is KING GEORGE, but his proper name is KERU; his native title, the Kusaian name for King, is Tokesau, a term found in various parts of Micronesia, sometimes even applied to a deity; his reign must have commenced in 1837 or 1838. His large, strongly built house, thatched with a species of palm, is on Lela island, and is full of curiosities obtained from various sources. The whole population seems saturated with disease, and is rapidly on the decrease.

Dr. GULICK (1862) speaking of the houses and stone walls on Lela island, says,—“From D'URVILLE's reports, and from the accounts of sea captains, we had received glowing ideas of the architectural exhibitions on Lela; we were to find a native city handsomely laid out, with paved streets and, at frequent intervals, handsome piles of stone-cut masonry. On the contrary, we found nothing but muddy paths, zigzagging hither and thither over rubbish and stones. There were many stone walls three or four feet high, evidently of very recent origin; and scattered among the groves

were indeed evidences of ancient labour, consisting of artificial islets, built up above high-tide level, and almost cyclopean lines and enclosures of stone walls. Banyan-like trees had in many cases sent their roots into the very centre of these structures, and from some spots the stones have been entirely removed. A line of stone, varying in height in different parts, surrounds a considerable portion of the central hill of Lela. Not far from the king's and his eldest son's residences are several enclosures, about 200 feet by 100, with walls 20 feet high, and, in some places, at the foundations 12 feet thick. We partially traced at least one very much larger but less perfect enclosure. The walls are built of basaltic stones, occasionally filled in with coral. Some of the rocks are very large irregular masses, while others are beautiful pentagonal prisms. There is not the remotest trace upon any of them of a stonemason's adze. Along the south-western shore are a number of canals communicating with the harbour, and in which the sea ebbs and flows. The sides of the canals are in some cases crumbled, but bear evident tokens of having been artificially built; and the islets themselves are evidently in a considerable degree artificial, composed principally of coral stones, the rubbles, perhaps, of the canals themselves. These canals intersected each other, and so formed islets; on at least one of which is found a towering stone enclosure. Mangrove trees have in many cases choked up these water-courses, and, with other kinds of trees on the islets, have nearly buried the whole in a shade most congenial with the thoughts excited by these relics of a dimmer age than that which we might hope had now dawned upon them.

"King George informed us that these walls were built by the former inhabitants. Many of the larger rocks were brought from the main island on rafts. When we asked how such heavy blocks could be elevated so high, he replied they were rolled up from one level to another on inclined planes of logs and stones. As to their uses, he said the wall about the hill was for defence from aggressors from the main island, and that many of the remaining walls were in honour of the dead. Nothing could be more probable and satisfactory; nor could anything be more improbable or unsatisfactory than to import a company of buccaneers, or any civilized people, to build what could not be at all to their purpose, nor to the credit of their architectural talents, and what it would have been morally impossible for them to have done. The inhabitants of Kusaie are even now skilled in wall building. We were told that one of their most decisive evidences of public grief is to rebuild the wall about the premises of a bereaved chief; and to this day chiefs are buried in the ancient enclosures, as though they were the mausoleums of the great. Possibly they may in the first instance have been built about royal residences, and on the decease of the builders, have become their magnificent sepulchres, though the analogy of present Micronesian customs decides against it."

At high tide the water flows for a quarter of a mile or more through the midst of the mangroves and up the shore of Kusaie.

**Lela, or Pane harbour**—Chabrol of the French charts—on the N.E. side of the island, is spacious, but exposed to the prevalent winds, consequently not easy to leave. The depth at entrance is from 45 to 30 fathoms, decreasing to 5 fathoms at the upper end. H.M.S. *Serpent* (1853) anchored in the southern part of the harbour, about 2 cables off the shore, near the watering place.

"On examining the watering place it was found to be a small stream with good water running over a sandy beach into the sea. The casks could only be filled at high water, and then required 120 yards of hose; but with about 200 yards of it water could be procured at any time of tide. The rise and fall of tide is about 7 feet. Whalers obtain their water by rafting; but the plan of getting it in bulk when practicable is much cleaner and more expeditious. A few hogs were procured; plenty of *taro*, a species of yam, bread-fruit, and cocoa-nuts; a few fowls, but they had all run wild, and had to be shot. There were no bullocks on the island." Things have, however, probably changed for the better since the missionaries are established on the island.

*Position*.—DUPERREY made the S. point of Lela islet in lat.  $5^{\circ} 20' N.$ , long.  $163^{\circ} 5' 20'' E.$

**Coquille harbour**, on the N.W. side of Kusaie, is very advantageously situated, and, when through the entrance, the water is as smooth as a mill-pond. The anchorage is excellent, with good holding ground, on a bottom of black mud, in from 13 to 15 fathoms, a  $\frac{1}{2}$  of a mile westward of a small islet at the head of the harbour. The entrance is very narrow (about 180 yards wide at most), but deep, and a good look-out should be kept for the coral heads in proceeding to the anchorage.

*Position*.—DUPERREY made the islet at the head of the harbour in lat.  $5^{\circ} 21' 25'' N.$ , long.  $163^{\circ} 0' 51'' E.$ —LUTKE made it 4' further east.

**Lottin harbour**, on the south side of Kusaie, in which is a depth of 23 fathoms in the centre, is small, but well sheltered, and easy to enter and depart from, with the prevailing winds.

*Position*.—DUPERREY made the E. point of entrance in lat.  $5^{\circ} 16' 44'' N.$ , long.  $163^{\circ} 1' E.$ —LUTKE made it 4' further east.

The southernmost point of Kusaie (point Tupinier according to DUPERREY's chart) is in lat.  $5^{\circ} 15\frac{1}{2}' N.$

LUTKE made the centre of the island in lat.  $5^{\circ} 19' N.$ , long.  $163^{\circ} 6' E.$ —the latter corrected for the position of Kiti harbour (see p. 218) would be  $163^{\circ} 4' E.$ , and thus the agreement with DUPERREY's positions becomes very close.

"The island of Kusaie may, in the future, become of great importance. Lying in the track of vessels bound from Australia to China, it offers good ports for heaving down, abundance of water, and various kinds of refreshments" (DUPERREY).

N.B.—All the positions of the Caroline Archipelago have been collated (more or less) with LUTKE's Atlas.

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**Islands, Reefs, and Shoals, South of the Caroline Archipelago,  
between Lat.  $5^{\circ} N.$  and the Equator, and between  
Long.  $135^{\circ}$  and  $166^{\circ} E.$**

*Warwick island*, a whaler's report, in lat.  $4^{\circ} 24' N.$ , long.  $136^{\circ} 26' E.$ , is otherwise unknown.

A *shoal*, with 13 fathoms on it, is stated to exist in lat.  $4^{\circ} 10' N.$ , long.  $150^{\circ} 10' E.$ ; nothing further is known of it.

**Indiana reef.**—Capt. MACKAW of the *Indiana*, Oct. 11th, 1856, on the voyage from Australia to China, discovered a coral reef, almost dry in some places, extending N.E. and S.W. a  $\frac{1}{2}$  of a mile. The lookout at the masthead also saw broken patches of water to the eastward; and another patch of breakers was seen from the forecandle to S.W.-ward about  $2\frac{1}{2}$  to 3 miles distant from the ship. A cast of the lead while passing between the two reefs gave no bottom at 12 fathoms, ship going 8 knots. *Position* of shoalest part, lat.  $3^{\circ} 20' N.$ , long.  $160^{\circ} 18' E.$

A reef, whaler's report, in lat.  $2^{\circ} 25' N.$ , long.  $153^{\circ} 50' E.$ , is otherwise unknown.

**Atlantic island**, a whaler's report (1827), in lat.  $1^{\circ} 5' N.$ , long.  $164^{\circ} 57' E.$ , has been seen only once; nothing further is known of its position and extent.

**GREENWICH Islands.**—This low coral atoll, with several small islets on it, was reported in 1851-52, and its position was stated to be lat.  $1^{\circ} 5' N.$ , long.  $154^{\circ} 30' E.$

The next notice of the group is from the French, and to the following effect:—the corvette *Constantine* on a voyage from Hong Kong to the isle of Pines, Dec. 20th, 1853, steering S.S.E., was not supposed to be within 40 leagues of any known island, when the lookout announced low land to the S.W., which soon became visible from the bridge as a group of small, low islets. They were approached sufficiently near to fix their position, to delineate them on the chart, and to make a sketch of their appearance.

Viewed from the N.E. these islets—13 in number—seemed to be based on a coral reef, enclosing a large lagoon, which extends 7 miles (N. and S.); being covered with a stunted vegetation, the highest part of the northern islet might be seen about 12 miles, while the remaining islets were still invisible. There was no sign of their being inhabited.

*Position* of the highest point of the northern islet: lat.  $0^{\circ} 58' 51'' N.$ , long.  $154^{\circ} 47' 50'' E.$

According to the sketch in the *Annales Hydrographiques*, vol. x. p. 168, from which the above notice is extracted, the eastern side of this lagoon island extends from lat.  $0^{\circ} 54'$  to  $1^{\circ} 2' N.$

In 1864, the *Northfleet* appears to have been becalmed in this neighbourhood, and Capt. W. SYMINGTON states (*Naut. Mag.*, 1865) that "the latitude of the middle of the eastern side is in  $1^{\circ} 4' N.$ , and long.  $154^{\circ} 45' E.$ , measured from Sydney in twenty days. It is of the usual form of a coral lagoon in its earliest stage, only one-third of it being above water, and consisting of twenty-six little islets, a few feet above water, and covered with cocoa-nut trees. Reefs extend in a W.N.W. direction from the extreme N.W. islet to a distance of 5 miles."

In 1865 the Spanish frigate *Berenguela* made the centre of the group in lat.  $1^{\circ} 3' N.$ , long.  $154^{\circ} 54' 50'' E.$ ; in other respects the description agrees with the earlier ones.

*Position.*—The centre of the atoll is in about lat.  $0^{\circ} 59' N.$ , long.  $154^{\circ} 45' E.$

**Shoal**.—The *Decapolis*, in May, 1869, passed within  $\frac{1}{2}$  a mile of a supposed shoal of small extent on which the sea broke occasionally; there was but little wind at the time, the sea being comparatively smooth; *Position* given, lat.  $0^{\circ} 32' N.$ , long.  $152^{\circ} 51' E.$ , by D.R.

An island on the Equator, in long.  $165^{\circ} 33' E.$ , a whaler's report, is otherwise unknown.

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### MARSHALL ARCHIPELAGO.

The Marshall archipelago has, for the last forty years, been the least known, and the most dreaded of the Micronesian islands. It lies eastward of the Caroline, and N.W.-ward of the Gilbert, archipelago. Its various groups range between lat.  $4\frac{1}{2}^{\circ}$  and  $12^{\circ} N.$ , and between long.  $165\frac{1}{2}^{\circ}$  and  $172\frac{1}{2}^{\circ} E.$

Two chains of islands, lying nearly parallel with each other, and running about N.N.W. and S.S.E., are included under the name Marshall archipelago. The more eastern is the *Ratak*, and the western is the *Ralik*;\* the former including fourteen, and the latter fifteen low coralline islands and groups of islands.† Several of these islands are very small,—without lagoons; but the greater number are fully formed *atolls*,—some of them being of immense size.

"It seems almost certain that ALVARO DE SAavedra, in 1529, visited islands in both the Ralik and Ratak chains, when on his attempted return to New Spain from the East Indies *vid* Papua or New Guinea. Steering E.N.E from Papua (or as the Spaniards called it, the Island of Gold), they came to a group of small islands in  $7^{\circ} N.$  They were inhabited by natives of a dark colour, who wore beards, and whose bodies were marked as if with an iron. In consequence of this marking, which was undoubtedly tatooing, and of which this is the earliest notice I have seen, the islands were called *Los Pintados* (or Islands of the Painted People).

"The reception of the Spaniards at this island was so hostile that they passed on to the N.E., eighty leagues, when another group of low islands was seen, the inhabitants of which received them so kindly that the voyagers named their discovery the 'Good Gardens.' The inhabitants of this group were light coloured like those of the first, and like them were painted or marked. The women, it is said, appeared beautiful; they had long black hair and wore coverings of very fine matting—a description that answers well to the females of the present day on the Marshall

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\* *Ratak* signifies *eastern*; and *Ralik* *western*, in the language of the Marshall islanders.

† According to the statements of the Micronesian missionaries, Gaspar Rico (or Taongi) belongs to the *Ratak* range; also, Brown group (or Eniwetok) and Providence group (or Ujilong) to the *Ralik* range; in which case the former consists of fifteen, and the latter of seventeen groups.

The introduction and general details respecting all these islands have been derived from information furnished by Dr. GULICK and other missionaries, collated with the observations of various navigators.

islands, and to no others of the Micronesian islands. It is further recorded that their canoes were made of fine wood, which is at certain seasons drifted there, a fact which is still to be observed on the Marshall islands, though the principal wood used in building proas is the bread-fruit. The natives supplied their visitors with two thousand cocoa-nuts, which, next to the *pandanus*, is the staple of all the low islands.

"More than two centuries passed before these island were, so far as we know, again visited. In 1767, Capt. WALLIS, of the English navy, discovered two groups in the northern extreme of the Ralik chain, which he supposed to be the Pescadores found on the charts of ANSON, who passed near this region in 1742 on his way to Tinian of the Mariana islands. These groups are undoubtedly the Ailinginae and Rongerik of the natives, and the Rimski-Korsakoff islands of KOTZEBUE.

"In 1788, the ships *Scarborough* and *Charlotte*, under the command of CAPTS. MARSHALL and GILBERT of the English navy, returned to China from Port Jackson, where they had been to commence the colonization of Australia, and on their route they struck first on the northern portion of what has since, according to KRUSENSTERN, been called the Gilbert archipelago, and then upon the eastern chain of what, by the same authority, has been called the Marshall archipelago. The report of these discoveries was given by Governor PHILLIPS, who accompanied the expedition; but it is a 'loose account,' and did not aid materially to a knowledge of the inhabitants.

"In 1792, Capt. BOND discovered two of the Ralik islands, and in 1797, Capt. DERMOTT still another. Capt. BISHOP, of the *Nautilus*, in 1799, passed several of the Ratak islands seen by the last voyagers, and discovered one or two not before reported. In 1804 the English ship *Ocean*, and again in 1809 the brig *Elizabeth*, saw several of the middle Ratak islands. But of all others, the most important name connected with the Marshall islands is that of KOTZEBUE, of the Russian navy.

"In May, 1816, KOTZEBUE first saw the closely connected groups of Taka and Utirik, while on his way to the north. In January succeeding, after recruiting at the Sandwich islands, he again visited this region, and discovered and thoroughly explored the greater number of the Ratak islands. In October of the same year he again returned (directly from the north) to these islands, and added still another group to his discoveries, so leaving only the three southern atolls of the range unexplored. In October, 1825, on his second voyage, he again visited these islands, and added to his former explorations the four most northern groups of the Ralik islands, the most eastern and western of which may be called discoveries, though he made most singular and confusing mistakes in giving native names,—mistakes never before noticed, and which long perplexed the writer of the present paper, who feels that he is able for the first time to present a tolerably correct list of the Ralik islands.

"KOTZEBUE's merits in connexion with the Marshall islands are very considerable. He first gave an account of the inhabitants in a graphic narrative that correctly depicts the islands and the external life of the inhabitants, so far as he had time for observing it. His reports of their habits of thought and feeling, were, as a matter of course, far too highly coloured and very defective. The efforts made by himself

and the celebrated naturalist, CHAMISSE, who accompanied him, to introduce new plants, and so add to the limited resources of the people, were certainly very commendable, but nothing ever came of them, from the innumerable rats, and the ignorance of the people, and, above all, from the utter incompatibility of the soil with foreign vegetables.

"But a few months since (1861) I saw a native of the Ratak chain, who told me of the visit paid their islands long ago by a ship whose commander was named TOBU—undoubtedly KOTZEBUE—and he correctly named to me the islands visited by him. The same name also occurs in some of the songs of even the Ralik islanders.

"It seems unnecessary for the sake of enhancing KOTZEBUE's merits to claim for him the discovery of the greater number of the Ratak islands, as was done by KRUSENSTERN, and to suggest that CAPTS. MARSHALL and GILBERT discovered the Ralik range. Though there are many discrepancies hard to reconcile, it is but just to recognise the prior claims of the English navigators, and to acknowledge that KOTZEBUE first definitely located them on the charts.

"The next source of information regarding the Marshall islands was in 1824, when a part of the crew of the American whale-ship *Globe*, mutinied and landed on Milli (or the Mulgrave group), which is the most southern of the Ratak islands. A few of the crew regained the vessel and navigated her to the Sandwich islands. In December, 1825, the U.S. schooner *Dolphin*, having been sent for that purpose, arrived off the island and took LAY and HUSSEY, who were all that remained of the mutineering company. These were mere youths, and had taken no part in the mutiny. They subsequently published a narrative of their residence on Milli. The mutineers were killed by the natives in revenge for their brutal treatment of the females they took for wives. In 1858 the Rev. Mr. DOANE visited this group; and the spot where the *Globe* was anchored, together with the islet where the mutineers lived, were shown him.

"In 1824, Capt. GEORGE RAY discovered Ebon, or Boston island, the most southern of the Ralik islands. It was in 1824 that Capt. DUPERRY passed Milli, and also touched at Jaluit of the Ralik islands. Again in the years 1829, 1831, 1832, and 1835, Captains CHRAMTSHENSKO, HAGEMESTER, and SCHANZ, of the Russian navy, passed several of the central Ralik islands. But notwithstanding these many visitations, the Ralik islands are yet most incorrectly represented on all the charts,—which comes principally from the reports not having been implicitly followed by the compilers.

"Events of violence commenced in the Marshall islands in 1834, when Capt. DOWSETT visited the so-called Pescadores. Here his boat's crew was cut off while he himself had gone inland, holding friendly intercourse, as it would seem, with the natives of the village. Those left in command of the vessel became alarmed on seeing the skirmish on the beach, of which the captain was probably ignorant, and, immediately putting to sea, returned to the Sandwich islands. The same year the *Waverley* was fitted out from Honolulu to search for Capt. DOWSETT. On arriving at the island, the name of DOWSETT was found cut on trees, and garments of his were found. The natives seemed to wish to say that Capt. DOWSETT had gone to sea. But the captain of the *Waverley* very rashly, and we must say cruelly, fired

upon them, killing many and otherwise injuring them. From there the *Waverley* went to Ponapi, and thence to Kusaie, where she was cut off. Capt. DOWSETT's fate has never been ascertained. It has been reported that he was alive on the Ralik islands as late as 1843. But it seems to myself most probable that he reached Ngatik or Raven island (Carolines) in his boat and was there killed.

"In 1845, Capt. CHEYNE, of the trading schooner *Naiad*, passed Ebon or Boston island. He detected the natives stealing, and used what was probably undue violence, when they became exasperated and showed fight. A severe tussle ensued, in which one person was killed on the spot, and another, a nephew of the highest of the Ralik chiefs, was so severely wounded that he died soon after reaching the shore. It seems probable that the natives cherished revenge for this during many years. A whale-ship was nearly captured off Namorik or Baring island about this time; and two whaleboats' crews, who had lost their vessel, came on shore at Ebon, and were all killed.

"Towards 1850, one or two whaling captains endeavoured to establish a cocoa-nut oil trade with the Ralik islanders, but never came completely in their power. In October, 1852, the schooner *Glencoe*, of San Francisco, came from Ponapi to Ebon, and most imprudently anchored just under its lee. The vessel was cut off, and every soul killed.

"In December of the same year, Capt. M'KENZIE, of the trading schooner *Sea Nymph*, also of San Francisco, but last from Ponapi, anchored in the lagoon of Jaluit or Bonham island. He one day incensed a chief by rough, abusive conduct, who avenged himself by stimulating his relatives and attendants to kill the captain the next time he landed, and to murder all but one of the crew.

"The Rev. Dr. PIERSON, of the Micronesian mission, touched at several of the Ralik islands in 1855, while cruising with Capt. HANDY, of the barque *Belle*. The subsequent year a party of Ralik islanders drifted 350 miles westward to Kusaie, and there became further acquainted with Dr. PIERSON, and desired that he would go and settle among them on the Ralik islands; to which they in a few months returned in proas of their own construction. In 1857, the Rev. Messrs. PIERSON and DOANE removed to Ebon, and there the latter of these missionaries still lives, successfully reducing the language to writing, and preaching the gospel to those whose hands have so recently been imbrued in the white man's blood.

"This people, the history of whose contact with the civilized world has been thus briefly given, do not, probably, number over about 10,460; or about 5790 in the Ratak chain, and probably 4670 in the Ralik islands. And yet almost every one of their thirty atolls is inhabited; from which it may be gathered that the islands are but sparsely populated. Yet intercourse with a very considerable portion of the inhabitants is secured by taking a permanent station, for they roam in their proas from island to island of their respective ranges. There is comparatively little intercourse between the two principal chains, but a very considerable portion of their time is spent by the inhabitants either in voyaging or preparing to voyage within their own ranges. Since the time of KOTZEBUE, almost the whole of the contact with the so-called civilized world has been enjoyed by the Ralik islanders, who now pride themselves upon being the medium of communication with foreigners, and upon being best posted regarding the great outer world. Yet I recently saw a man from

the more northern Ralik islands who had never seen a white man before he saw us on Ebon.

"Nominally each range is subject to a high chief, or more properly to a chiefish family. But several of the southern Ratak islands are now independent of the feudal head, who lives on Aurh. So also in the Ralik chain, the four northern islands are held by a very slight cord of dependence. And even where the authority is most potent, it is not of a very palpable character to one looking for the kingly tyranny on many Pacific islands. There is oppression, and outrage, and cruelty, but it is rather the petty usurpation of individuals and families than the systematic grinding of a despotism.

"It is interesting to find the same system of clans here that is found in all the Caroline islands of which we have any definite knowledge. Many of the clans are different, but several are the same as those found westward, though with different names. There is the same law, which counts descent by the mother rather than the father. As in most of the Caroline islands, one clan furnishes the chiefs of real blood, and another embraces the sons of these true chiefs. This comes from a true chief not being allowed to marry into his own clan, but into that to which his children ought to belong. Different clans have the supremacy in the different ranges, and it is possible for different islands of the same range to acknowledge different clans as paramount; from which it may be seen how difficult it is to properly apprehend, and how much more difficult to accurately state, the political affairs of this people.

"The language of the two ranges (Ratak and Ralik) is substantially the same, though there are dialectic differences. And though the vocabulary of this language differs from any spoken in the Caroline archipelago, its grammatical construction bears the most striking similarity to those westward, as has been shown by the Rev. E. T. DOANE.

"In physical appearance the people are not unlike the Caroline islanders, as described on Ponapi and Kusaie, save perhaps that they are a little coarser and more vigorous in their manners, and perhaps also a little darker complexioned. Their male dress, of a skirt of hibiscus bark, and the beautifully ornamental mats worn by the females about the hips, render them very decent in their externals. They seem more excitable and mercurial than any of the Caroline islanders we have met; but this comes in part from their slight contact as yet with foreign vice and disease.

"It is sad to be obliged to report that disease is now being rapidly introduced among the Ralik islanders by whale-ships passing the islands, and which now venture to permit natives, with females, on board their vessels. The strength of the race will ere long be sapped. How sad that the safe residence of missionaries among them should be the cause of attracting physical and moral death to their shores! How difficult to sustain hope in one's heart when planning for the elevation of a people, whose contact with the representatives of civilization serves, with but few exceptions, to render their diseases more deadly and their vices more vicious!

"Like all the Micronesians, these people are worshippers of their own constructed deities, and also respecters of the spirits of their ancestors. They have the reputation among the islands to the west, where they are frequently drifted, of being exceedingly

skilled in every kind of incantation and necromancy. They are, if possible, the most superstitious of Micronesians. Their mythological tales are exceedingly numerous, and of interest in showing the range of ideas possessed by a people inhabiting so unfavourable a locality. And it must be confessed they betray no intellectual poverty as compared with their brethren in any part of the Pacific. The missionary finds no less mind and material to work upon than among the inhabitants of higher islands, notwithstanding Mr. J. D. DANA's supposition to the contrary.

"Great taste is shown in the embroidery of their beautiful mats. Their houses, however, are scarcely anything more than roofs supported on posts, with a floor on a level with the eaves, forming a loft where treasures are kept, and where men and chiefish women may sleep.

"In the construction of their proas their greatest talent displays itself. Many of these are of great size, capable of carrying 50 to 100 men in the open sea. One side is flat or perpendicular, while the other is convex. The outrigger is attached to the convex side of the canoe. The canoe or proa is thus very sharp, not only at the two ends, but along its whole keel. It settles deeply into the ocean, and by carrying its outrigger to windward, its flat side is to leeward, thus enabling it to hold its own as scarcely any civilized vessel can. It therefore sails very close to the wind, and with its tri-cornered, or leg-of-mutton sail, it beats rapidly to windward. They provision these proas with cocoa-nuts, preserved bread-fruit, *pandanus*, *taro*, and water, and can, when occasion requires, by their skill in fishing and catching water, sustain a voyage of several months. This explains the almost fabulous accounts of their drifting three, four, and five months without seeing land; and goes far in explaining the mode in which those and other Pacific islands were first populated. The Marshall islanders are probably the greatest voyagers now remaining in the Pacific Ocean. A party of them this year (1861) beat back to their homes from Wellington island, which is nearly 600 miles to the west, and that without any of the appliances the educated navigator would consider indispensable. Their passion for voyaging will yet facilitate the spread of the Gospel among them. They have a very accurate knowledge of the islands of their own seas, and a wonderful tact in navigating. They even construct rude maps by which they retain and impart knowledge regarding the direction and relative distances of the various groups. These maps consist of small sticks tied together in straight or curved lines, intended to represent the currents or waves to be met, while the islands are to be found at certain points where these lines meet. The construction of these maps is a secret which the chiefs would retain for themselves; and the individual who first divulged the art to us, though a chief, was threatened with death.

"Most appropriately do these people plant canoe-paddles about the graves of their more illustrious dead. Nothing on these islands is more interesting than a visit to the desolate cemeteries, under the towering cocoa-nut trees, where paddles in various stages of decay lift their blades amongst the coarse vines and scattered shrubs, while scores upon scores of fearless rats perform their gambols before your eyes, or squat like squirrels as they watch your movements. Very many of the dead are not buried, but are sent to sea with various religious rites.

"It was in December, 1859, that I first landed on Ebon, and there I spent seven of the pleasantest months of my life. To one whose experiences had been on the

high basaltic islands of Micronesia, there was something romantic in a residence on this gem of a coral island, under the groves of towering cocoa-nuts, *pandanus*, and bread-fruit. For, strange as it may seem, they not only all grow more stately here than on the more highly favoured islands, but the cocoa-nut and *pandanus* are far more productive.

"The *pandanus* in particular assumes a character on a coral island that would hardly be expected from anything seen of it in other situations. It is an interesting fact that has escaped the transient investigator, that the fruit of the *pandanus* is of vastly more importance to the inhabitants of such islands than the celebrated cocoa-nut. Even on the comparatively unproductive Kingsmill (or more properly Gilbert) islands, they can use up the greater part of their cocoa-nuts in the manufacture of oil and still subsist luxuriously on the drupes of the *pandanus*; on the Marshall islands, where the bread-fruit and jack-fruit (or mimic bread-fruit) grow so luxuriantly, this is still more emphatically true; and Mr. DANA of the U.S. Exploring Expedition, is greatly mistaken when he speaks of this fruit as 'a sweetish, husky article of food, which, though little better than prepared corn stalks, admits of being stored away for use when other things fail.' The drupes of several varieties of the *pandanus* are really luscious, and are probably much more nutritious than sugar cane. There are several months of each year, when it is in season, that natives eat little else, besides preparing large quantities of it for future use. This article, as prepared on the Marshall islands, is an admirable one—very palatable, and one which a foreigner readily becomes fond of. It is put up in large rolls and wrapped up in the leaves of the tree, then bound very tightly and nicely with cord, and may be kept thus many years. It is not injured by exposure to the weather, or even by long submersion in the ocean. It is, therefore, an admirable preparation for taking to sea. The tree itself often grows as high as the cocoa-nut. Its straight, tough trunk is used on the Gilbert islands in preference to every other kind of wood in building their largest and finest council houses. How opposite are these facts to the assertion that the *pandanus* is useful to man in no way but by furnishing material for thatching!" (Dr. GULICK.)

The Rev. E. T. DOANE (1863) gives the following general sketch of the character of the various *atolls* composing the Ratak and Ralik groups:—"Of the *atolls* of the two groups some are large, measuring 40, 50, and 60 miles in circumference, while others are mere bank-reefs—2 or 3 miles in circumference. Of the large islands, I may mention Jaluit (or Bonham), Rimski Korsakoff (or Rongerik), Rongelab, and Milli (or the Mulgrave islands). Of the mere bank-reefs I may mention Kili (or Hunter) and Lib (or Princessa island). And I would here remark, perhaps no group of the Pacific presents a more tangled mass in the nomenclature of its islands than does the Marshall archipelago, and especially the Ralik range: some of the terms given above may perplex the reader as he attempts to trace them out on ordinary charts.

"The general features of these *atolls* are similar to those of most coral islands. They are low, the reef-rock in none probably measuring more than ten or twelve inches in elevation. In form, however, there is much diversity. Milli (or Mulgrave island) is nearly a parallelogram; Majuro (or Arrowsmith) is oval; Ebon, circular; while Jaluit (or Bonham island) and Ailinglabelab (or Elmore islands), and many others, are without any definite forms.

"The atolls vary in fertility. Those south of 8° N. possess, from all native accounts, the most fertile islets and the most available soil. Their fertility may be accounted for from the fact that more rain falls on them. They are more affected by the equatorial belt of 'constant precipitation' which is ever oscillating backwards and forwards over them. Dead leaves and wood rapidly decay.

"It is an interesting fact, anomalous to the general features of coral islands, that the *leeward* side of these islands possesses the largest body of land;—indeed the windward side of many of them is entirely destitute of land,—or possessing it only in small islets. On Milli (or Mulgrave), Majuro (Arrowsmith), Jaluit (Bonham), and Ebon islands, which the writer has visited, this is emphatically true. The windward side of Majuro is possessed only of small islets, while the leeward side is one continuous strip of land, 25 miles long. Jaluit is much like this; perhaps, however, it has not so continuous a piece of land on the leeward side, though there is here the most fertile soil. On Ebon this is likewise true.

"An explanation of this fact may perhaps be found in the strong winds,—the N.E. trades sweeping with all their force for one half the year over these reefs. These strong winds, and the heavy sea they raise, tend to sweep off the material which might accumulate there; and bearing some portion on across the lagoon to the leeward side, is there lodged, and helps forward most rapidly the accumulation of the beach formation.

"The fact has been stated that the northern atolls of the Marshall archipelago are rather subsiding than otherwise,—vide DANA's *Coral Island*, p. 134. It may be asked, is this not rather apparent than real? May not the small amount of wooded land found there—for this is the basis of the statement—be owing rather to the heavy seas and winds which there prevail? The natives ever speak of the heavy winds of that latitude, 12° N. Islands have been desolated by them. We feel disposed to offer this as a solution of the fact.

"Another fact, we would state as common to the whole group,—is the existence of large ship channels on almost every side of the lagoon. Milli possesses four large ones,—three of them, and one the largest of all, on the windward side; Jaluit has its reef pierced by as many, and much in the same position; while Majuro has its channel on the windward side only, and Ebon on the leeward. I cannot speak of more from personal observation, though the natives say the other islands possess many channels and in much the same position as those above mentioned."

**Winds and Currents.**—As regards the *seasons* and the *wind*, they are similar to what has already been described among the Carolines and at Ponapi (*see* p. 210–213), with the exception that the wind in the Marshall archipelago is generally stronger,—and gales more frequent. The N.E. trade-wind cannot be relied on until north of lat. 5° or 6° N.—where at times it blows with great strength.

With respect to the *currents*, Capt. MOORE of the *Morning Star* (1857) observes:—"That space of ocean between the two chains, we will call the *Ratak sea*, in which it is supposed there exist dangers of a formidable character. How far this may be true of the southern portion I am unable to say; but having made a cautious survey of the northern part, I am prepared to believe that navigation is endangered more by conflicting currents than by labyrinthine reefs. As may be supposed, among so many islands, there is no regularity in the set of the current. Sweeping against the

coral walls, and turned aside into channels where it is interrupted by the same natural causes that produced its check in the first instance, it is thrown into whirlpools and eddies, with no particular converging point, and hence only calculated to confuse and mislead unwary navigators."

And Capt. BROWN, who subsequently commanded the *Morning Star* (1859-1860) says,—“The position of Likiep, north of lat.  $10^{\circ}$  N., is away from the influences which render the islands further south the unpleasant spots they are; which must all be attributed to the track or course of the strong current often found to exist in this part of the Pacific, and running eastward between the parallels of  $3^{\circ}$  and  $7^{\circ}$  N.,—at times I have found it as far as  $8^{\circ}$  N. This current, within *about* these limits, is, I think, found to extend from the extreme western portion of the Pacific to the coast of Peru.” Again, “this current to the eastward which I found last year (during all our cruise) to prevail between Ponapi and north of the Gilbert archipelago, has almost utterly failed this year. The easterly winds are much more constant this year. In our last passage from Ebon to Apaiang, working eastward between the parallels of  $5\frac{1}{2}^{\circ}$  and  $3\frac{1}{2}^{\circ}$  N., had not a drain of current until, reaching long.  $173\frac{1}{2}^{\circ}$  E., in lat.  $5^{\circ}$  N., we found we had entered a set of 30 miles *eastward* per day, which we lost on reaching lat.  $3^{\circ} 20'$  N. While standing south for Apaiang, on this last visit, I found instead of the strong westerly current, a slight set to the south, say 10 miles per day.” . . . “To sum up respecting the currents: last year we found them generally in our track, running N.E. and E.N.E., 20 to 30 miles per day; through the season, the winds mostly light, variable, and westerly. This year very little westerly wind, current weak (mostly N.W.-ly.) until Dec. 1st, when the Trade came on strong, and the current began running 30 miles a day *eastward*; this current we carried to  $8^{\circ}$  N.”

The *variation of the compass* among these islands is  $9\frac{1}{2}^{\circ}$  E. in 1870.

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The **RALIK** chain, according to Dr. GULICK, consists of the following atolls and groups—viz., Ebon, Namorik, Kili, Jaluit, Ailinglabelab, Lib, Jabwat, Namu, Kwajalein, Lae, Ujae, Wotho or Watto, Rongelab, Rongerik, Ailinginae, Bikini, Eniwetok, and Ujilong.

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**EBON.\***—“This *atoll* is the most southern one of the Ralik chain. It was discovered May 25th, 1824, by Capt. GEORGE RAY, who named it **Boston** island. In 1834 Capt. COVEL thought it a new discovery, when it took his name (**Covel**), by which it is often called. The atoll is nearly circular, and measures some 25 miles in circumference.

“Except the passage near the centre of the West side of the reef, there is no other, not even for a boat. The reef, however, at high tide can be crossed by native craft.

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\* On KORZEBUE's chart of the Ralik chain, many of the names of the islands very closely approximate to those here given, following the missionary orthography, but the islands themselves are distributed very much at random—being located according to information obtained from the natives.

The passage\* is 12 or 14 fathoms deep, and at the inflowing and outflowing of the tide has necessarily a very strong current, being the only outlet for the whole lagoon, when the waters are lower than the reef. As it flows in against a strong wind, its presence may be traced across the lagoon, from the ripple of the waters and the white caps. The reef-flats near the lagoon entrance are being covered with sand and other

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\* The channel into the lagoon appears to be narrow. The Missionary ship *Morning Star* first entered it in 1857, and the following is Capt. MOORE's account of his bringing up there, and of his departure thence. "After rounding the S.W. point of the reef, we hauled up for the passage, and soon were met by fifteen or twenty canoes, having on board about 150 people, who manifested their joy by every demonstration possible—shouting, dancing, and singing. It being Saturday, I was anxious to find an anchorage, to avoid lying off and on during the Sabbath.

"Leaving the vessel, I went in to sound out an anchorage. The passage to the lagoon led in between two islets, flanked by wide reefs, between which I found a depth of 25 fathoms, with room sufficient for the vessel to swing clear of the breakers. From this position the bottom fell off at an angle of 45°, the danger therefore being that if we dragged at all it would be off shore. Going on board and seeing all ready, we stood in and dropped both anchors. It being near night I was unable to make any further explorations. Here we were where no vessel ever was before—at least, so says the oldest man on the island—in the mouth of a passage where the tide ran prodigiously, and heavy squalls rising in the E.N.E. The first one that struck us started our anchors, and from this time till Tuesday night I scarcely closed my eyes to sleep; the harsh, grating sound of the anchors, dragging over the rough coral bottom, sounded like distant thunder.

"At daylight, Sabbath morn, the wind hauled E.S.E., and then died away, when torrents of rain fell and continued till Monday morning, when it cleared up in fine weather, and, hearing of another anchorage further south, I hove up to go in quest of it, but after a faithful search, I found no such anchorage existed.

"Through Dr. Pierson, I informed the King of my determination to enter the lagoon, who promised to have men stationed on the reef to haul the vessel through the next day, if the wind continued ahead. During the night the tide set us far around to the east side of the island, and we did not get up in time to go in. Thursday morning came bright and clear, and we saw the natives mustering on the reef in great numbers. The wind was light from the East. Taking in all my square sails, and having anchors and lines all ready, we stood in. The tide was flowing. Just as we arrived at the confluence of the two passages I let go an anchor to bring her to, for the purpose of running lines to the reef. There were about 150 men on the reef in readiness for their task, and most nobly did they accomplish it, for she did not touch on either side. After clearing the passage we stood over to the east side of the lagoon, and then up to the anchorage. Here we lay perfectly secure. Boats can go and come at any time. Good water can be procured from Dr. Pierson's well. \* \* \* \*

"Christmas morning, commenced heaving short. Getting under way on a lee shore with a strong wind required some caution. Having carried out our kedgo, all hands clapt on, and we soon perceived that we were hauling it home. Weighing it, we carried it much further off. This time it held on, and we proceeded to heave up our anchor. So soon as it cleared the bottom our kedgo warp parted, and we were obliged to let go anchor again. I thought it was time now to go to work. Getting up two new coils of four-stranded Manila rope, we weighed the kedgo the second time, and backed it by another, and carried it out 100 fathoms. There being at this time sixty to seventy natives on board, we hauled the vessel ahead and let her hang till after dinner, being now sure of getting my anchor up so I could fill away and slip my lines. This was handsomely effected, and after getting an offing I sent the officers to weigh the anchors and bring them on board. All being ready and the wind being fair, we squared away and ran through the passage and hove to off the Mission."

coral débris,—the nucleus of some future islet. The small coral patches in the lagoon are all covered with a few inches of water at low tide. There is a tradition that once a passage existed of sufficient capacity to admit ships on the N.E. side, and that it was destroyed by some powerful spirit in his rage, and the present passage opened. The natives possess also an interesting tradition concerning the existence of a *high island as having once occupied the most of the lagoon*. It is said that tall hills, covered with bread-fruit and cocoa-nut, reared themselves where now the flats in the lagoon exist. It is said, also, that what must then have been the barrier reef is now Ebon islet.

“**Ebon**, the largest islet, occupies all the south side, and curves round the S.E. and S.W. ends of the reef, and it gives name to the whole atoll. Its length from point to point is about eight miles. A singular feature is found upon it, a hedge of coral conglomerate. On the North end of the islet it projects itself free from all soil or sand; and its course can easily be traced by its repeated outcropping. The land which lies on the sea side is of considerably more recent formation than that on the lagoon side. The difference is very perceptible. The ledge or embankment was formed no doubt mainly from the wash of the lagoon. This is seen from its lamination sloping that way. It undoubtedly served an important purpose in catching and holding the finer materials thrown up from the lagoon. At the S.W. bend of the islet the surface is quite uneven,—hills and vales, in miniature form and size, show themselves. They are formed no doubt by the drift of the sand, blown up into little hillocks. From its elbow round to the N.E. point the islet possesses but little soil. It is, however, covered with quite a heavy growth of bushes and trees, all possessing a very rich and deep green colour, and this is indeed characteristic of the foliage of the whole island. It has none of that sickly yellow, half nourished hue, which we find upon many coral islands—those especially of the Gilbert archipelago. On Ebon all the growth is beautiful. There is soil and rain enough to nourish well the tropical vegetation.

“I have not been able to obtain an exact classification of the plants of this atoll. More than fifty distinct species, however, will be found. We will mention some which enter chiefly into the support of native life. The *Artocarpus* is represented by some eight or ten varieties, one, the *A. integrifolia*, and the rest *A. incisa*. The *Pandanus odoratissimus* is represented by some twenty varieties; and its fruit enters largely into the native food. The cocoanut (*Cocos nucifera*) is represented by some ten varieties, distinguished only by the nut. Two varieties of taro (*Arum esculentum*) are plentifully grown, being raised in large beds prepared for it. Bananas are abundant, and the missionaries are now growing oranges and figs.

“This atoll is the home for a few varieties of birds. But in this feature of the island, the contrast is as wide between the low coral island and the high volcanic one, as between their natural features. The high islands of Micronesia are largely supplied with the feathery tribes; but this atoll can claim only a very few birds, and with two or three exceptions these are all water-fowl.

“At least five species of reptiles are found on the atoll. The varieties of insects are numerous; of ants, mosquitoes, and flies, there are large swarms; of centipedes there are many to be found, and of rather formidable size, though we rarely hear of

their biting any one. There are several varieties of spiders. The scorpion, though found on the atoll, is small and harmless.

"The *Crustacea* are numerous on land and in the water. The *Mollusca* too are abundant, and some rare specimens are found. A valuable and quite abundant sponge is also found in some of the lagoons of the Marshall archipelago.

"On the reef of this atoll, besides the islet of Ebon there are nineteen other islets; all of them are much smaller than Ebon—most of them mere patches—though for their size they are equally fertile.

"In the growth of some of these islets we have perhaps some interesting facts connected with the rate of increase of islets or coral reefs. Bikri, on the N.W. side, is an islet containing not more than an acre of land. A few *Pandanus*, self-sown from seed washed there by the waters of the lagoon or sea, have taken root. And there are a few bushes,—a variety which I have noticed as growing only on the frontier soil of an islet,—soil which is but little more than sand. From the leaves of these bushes and *pandanus*, soil is very slowly forming. But the present age of the islet is, as stated by a native who saw it when only a sand bank washed by the tides, some thirty-five years. He remembers it when a boy as only a sand bank. Now it has a little soil and a few bushes. The islet Aneming (southward of Bikri) he describes as once only a sand bank. It is now about the same size and in the same condition as Bikri. These facts are not stated, of course, as definite for determining the rate of growth of coral islets, for into such a calculation many other circumstances might enter, such as the position of the reef for catching and holding the washed up matter, &c. But we may learn from the facts here given that the growth of the land, like the growth of the reef-rock, is very slow.

"Near the southern extremity of *Toko* (the N.W. islet of the atoll, and next in size to Ebon) some thirty-five years since there was a passage sufficiently large to let a proa pass over the reef between what was then two islets. Now that passage has been filled up, and large bushes grow there. The only tree of any size is the cocoanut and *pandanus*, which have been planted. The fact we would state as illustrative of two points,—one bearing on the fact we have just referred to—the rate of growth of an islet,—and the other, that large islets are made by stringing, as it were, together several smaller ones. It may be questioned whether a large islet, say some two or three miles long, is one continuous production: it was rather formed by several smaller islets becoming attached, and the whole in time becoming one large islet. This fact, I think, can be clearly proved to have been the case with the growth of the islet of Ebon. There are several spots which may be indicated as the welding points of small islets. These places are usually narrower and less overgrown with bushes and trees, and possess a thinner soil than other parts of the whole islet. Then again, there are places which are expanded, just as if they had been the central nuclei of the islets; these are heavily wooded, having large bread-fruit trees and other trees of apparently an old age growing on them. There is reason to believe that all the islets of this atoll will in time be thus united, and thus the whole reef possess, so far as it goes, one unbroken chaplet of vegetation.

"We are now deeply interested in watching the formation of sand banks at one or two points. As yet they are shifting about, as the winds and seas prevail for a given time from any quarter; they are as yet covered at high tides. One of these

sand banks is near the northern point of Ebon islet, and we believe that it will yet become fixed, will enlarge itself, catch some floating seeds and appropriate them, and then there will be another green islet on the reef. This will again expand itself and become the connecting link of Ebon and Eni-armeth,—thus completing the length of the green band of this Ebon islet on its northern extremity.”—(Rev. E. T. DOANE.)

Ebon atoll contains about 1000 inhabitants. They are good seamen and great navigators—ranging through all the neighbouring seas; they sometimes leave the island by hundreds at a time in a fleet of proas, and do not return for a year or more.

*Position*.—The anchorage place of the *Morning Star*, just inside the lagoon, was determined to be in lat.  $4^{\circ} 39' N.$ , long.  $168^{\circ} 49' 30'' E.$ , but Capt. HANDY places the centre in lat.  $4^{\circ} 34' N.$ , long.  $168^{\circ} 45' E.$ , which agrees tolerably well with the position given by HAGEMEISTER, the centre in lat.  $4^{\circ} 39' N.$ , long.  $168^{\circ} 50' E.$ \*

**NAMORIE**.—This atoll was discovered by Capt. BOND in 1792, and named after the chairman of the court of directors of the E. I. Co., **Baring**. The reef is circular and small, having on it four or five low, well wooded islets. It unquestionably lies north *westward* of Ebon. Population about 400.

*Position*.—Capt. HANDY made the centre in lat.  $5^{\circ} 34' N.$ , long.  $168^{\circ} 18' E.$  The position given by the discoverer was by D. R., and 5' more to the westward. Lieut. KNOX, U.S. Navy, made it in lat.  $5^{\circ} 34' 42'' N.$ , long.  $168^{\circ} 28' 24'' E.$

KOTZEBUE gives a Namurick island, differing in position not far from the above (viz.  $5^{\circ} 40' N.$ ,  $168^{\circ} 3' E.$ ); the Admiralty chart calls it Ebon or Baring island, and places it in lat.  $5^{\circ} 35' N.$ , long.  $168^{\circ} 26\frac{1}{2}' E.$ ; the French chart calls it Baring island, and places it in lat.  $5^{\circ} 35' N.$ , long.  $168^{\circ} 26\frac{1}{2}' E.$

**KILI** is a small uninhabited islet,  $1\frac{1}{2}$  miles long (N. and S.), and  $\frac{1}{2}$  of a mile wide. It is elevated in the centre, and has no lagoon. It was first seen by Capt. DENNET in 1799, and named **Hunter** island. Capt. HANDY made its position (centre) lat.  $5^{\circ} 40' N.$ , long.  $169^{\circ} 15' E.$ , or 6' south and 15' east of that assigned it by the discoverer.

KOTZEBUE gives a Kili, but a degree out of position; the Admiralty chart places a Namurek or Hunter island in the position given by DENNET; the French chart places Hunter island in lat.  $5^{\circ} 42' N.$ , long.  $169^{\circ} 6' E.$ , as does Lieut. KNOX (Wilkes' Expedition).

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\* The Admiralty chart No. 2464, "sheet 6 of the Pacific Ocean, corrected to April, 1869," calls it Boston or Covell island, and shows the lagoon entrance on the W. side; centre in lat.  $4^{\circ} 35' N.$ , long.  $168^{\circ} 45' E.$  The French chart No. 1153, "Iles Marshall et Gilbert, corrections essentielles en 1869," calls it Boston island and makes it an oval shaped lagoon, 12 miles in diameter, with the opening erroneously placed at the N.E. end; centre, in lat.  $4^{\circ} 44' N.$ , long.  $168^{\circ} 10' E.$ , which is also an error. Capt. CHEYNE (1845) made it in lat.  $4^{\circ} 30' N.$ , long.  $168^{\circ} 42' E.$

Ebon is probably the Linnex islands, a whaler's report, in lat.  $4^{\circ} 30' N.$ , long.  $169^{\circ} 40' E.$ ; and the Fourteen Island group of the *Alliance* (1831), in lat.  $4^{\circ} 30' N.$ , long.  $169^{\circ} 30' E.$

Ebon is indicated by name on KOTZEBUE's chart, but greatly in error as to position.

N.B.—English and French Admiralty charts referred to throughout this notice of the Marshall archipelago will be the charts specified above.

**JALUIT.**—This atoll was discovered by the brig *Elizabeth* in 1809; only the south part of it was seen, which is described as "a group of islands joined together by low sand banks, probably covered at high water. From the S.E. point of the island a very dangerous, low, sandy point, with scarcely a tree or bush on it, extends to the eastward and northward, 2 or 3 miles, with a very heavy surf breaking on it." It received the name of **Bonham** island.

In 1824 **DUPERREY** in the *Coquille* passed along the N.E. side of the atoll, which, from his chart appears to extend N.W. by W. and S.E. by E., 27 miles, and presents



*Jaluit (Bonham), A bearing N. 64° W. (true), dist. 6 miles (Duperrey).*

a coral reef with 35 to 40 small islands and islets on it,—the reef itself being here and there in detached portions. This side he calls the **Coquille** islands; and the S.W. end, **Elizabeth** islands;—he made the N.W. end in lat.  $6^{\circ} 16\frac{1}{2}'$  N., long.  $169^{\circ} 30'$  E.,—and the E. end in lat.  $6^{\circ}$  N., long.  $169^{\circ} 50'$  E.

**CHREMTSHENSKO** made the group 30 miles long (N.W. and S.E.), and 20 miles broad; with four large islands and nineteen islets on the reef, and one near the centre, detached from the others; and with three entrances to the lagoon,—one on the north, another on the west, and a third on the S.E. side of the atoll.

Capt. **BROWN** of the *Morning Star* (1858) says the atoll "is full 40 miles, north and south, having an average width of 8 miles. Its form is irregular. The various islands are very beautiful, and abound in fruit. More shoals were found in this lagoon than in any we have seen: they are large and numerous; a vessel could hardly remain under weigh in the night without striking on them: they are composed of very sharp and hard coral, and we narrowly escaped once in the daytime,—though we constantly kept a lookout aloft." A poisonous fish frequents these waters. There is anchorage inside the lagoon, under an island called **Imurot**, where Capt. **McKENZIE** and all hands were cut off in 1854.

The population amounts to about 500.

Capt. **BROWN** places the S. point in lat.  $5^{\circ} 47'$  N., long.  $169^{\circ} 36'$  E.; the N.E. passage in lat.  $6^{\circ} 8'$  N., long.  $169^{\circ} 34'$  E.;—and the N. point in lat.  $6^{\circ} 22'$  N., long.  $169^{\circ} 22'$  E., which is probably 2' or 3' too far north, as **DUPERREY** crossed the meridian of the atoll in  $6^{\circ} 20'$  N.

**KOTZEBUE** gives a Telut, which in name may correspond with Jaluit, but a degree in error as regards position, agreeing in this respect more nearly with his Kili. On the Admiralty chart it is called Kyli, or Bonham island, on the French chart merely Bonham,—and in both instances closely approximating to **DUPERREY** and **BROWN**'s positions.

**AILINGLABELAB**, or **Ailinglab-lab**.—Dr. **GULICK** gives Ailinglabelab as the next atoll to the north of Jaluit, placing the S. point in lat.  $7^{\circ} 15'$  N., long.  $168^{\circ} 40'$  E.; the middle lobe in lat.  $7^{\circ} 46'$  N., long.  $168^{\circ} 23'$  E.; the connecting isthmus, or middle point, in lat.  $8^{\circ}$  N., long.  $168^{\circ} 13'$  E.; the N. point in lat.  $8^{\circ} 10'$  N., long.  $168^{\circ}$  E.; from which it would appear to consist of three parts.

The southern part is probably the *Elmore* islands, seen from the masthead by the *Elizabeth* in 1809. *CHRAMTSHENSKO* says this group consists of a large island and about twenty islets, connected by a reef, extending 20 miles N.N.W. and S.S.E., the southernmost island being in lat.  $7^{\circ} 15' N.$ , long.  $168^{\circ} 46' E.$ , and the natives give it the name of *Odia*. Captain *JAMES*, of the *Morning Star*, speaking of this part, says, "It is very irregular in its form, and extends N.W. to S.E. 25 miles: there is one passage on the south side, and several on the eastern and northern sides: in productiveness it is one of the poorest of the group, and offers no inducement to vessels calling there; position, centre, lat.  $7^{\circ} 29' N.$ , long.  $168^{\circ} 48' E.$ "

The northern part is the *Musquillo* group, seen by Capt. *BOND* in 1792, the day after passing *Baring* islands (*Namorik*), according to whom the eastern coast consists of twenty small islands lying nearly S. by E. and N. by W., connected by reefs and ledges; these islands are low and dangerous, but well covered with trees, and inhabited; lat.  $7^{\circ} 20'$  to  $7^{\circ} 47' N.$ , long.  $168^{\circ} 23' E.$  *CHRAMTSHENSKO* says this group consists of two parts, joined by a very narrow isthmus, and from a distance might be taken for two groups; the island forming the isthmus is in lat.  $8^{\circ} N.$ , long.  $168^{\circ} 13' N.$ ; the N. island in lat.  $8^{\circ} 10' N.$ , long.  $168^{\circ} E.$ ; the S. island in lat.  $7^{\circ} 46' N.$ , long.  $168^{\circ} 23' E.$ ; extending 30 miles N.W. and S.E.; and  $11\frac{1}{2}$  miles wide; the natives give the name of *Namu*.

The writer is in possession of no more information that would throw any light on Dr. *GULICK*'s atoll of *Ailinglabelab*; but the Doctor's statement is corroborated by *KOTZEBUE*'s chart giving a single atoll named *Odia*, extending from lat.  $8^{\circ} N.$ , long.  $168^{\circ} 15' E.$  to lat.  $8^{\circ} 15' N.$ , long.  $167^{\circ} 49' E.$

The Admiralty chart No. 2464 gives *Odia* or *Elmore* islands, an oval-shaped atoll, extent 20 miles, north and south, centre in lat.  $7^{\circ} 25' N.$ , long.  $168^{\circ} 46' E.$ ; and *Namu* or *Musquillo* island according to the description and position of *CHRAMTSHENSKO*. The French chart No. 1153 gives the same positions,—but the southern group is called *Elmore*, and the northern one *Musquitto*.

What connexion there is between the *Elmore* and *Musquillo* groups to form *Ailinglabelab* atoll, is not clear. The population amounts to 200.

**LILB.**—This is no doubt the *Princessa* of Capt. *DENNET* (1797), which he placed in lat.  $8^{\circ} 20' N.$ , long.  $167^{\circ} 30' E.$  *HAGEMEISTER* saw it, but *CHRAMTSHENSKO* did not: the *Lileb* of *KOTZEBUE*'s chart is very probably identical with it, but his position is bad.

Capt. *MOORE*, of the *Morning Star*, confirmed its existence in 1857. He says—"Having ascertained our position, I found that at noon we were about 40 miles south of the so-called *Menzikoff*,\* and 20 miles west of the north end of the *Musquillo* group, heading N.N.W.: at 2 P.M. land was announced on our lee bow: after carefully looking over my figures, and finding no error, I concluded that this land was part of the *Menzikoff* group, and that it had been laid down wrong on the chart. Going aloft, I perceived at once that we were approaching a compact, small coral

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\* An atoll, so called on the French charts; it is named *Quadelon*, or *Ocean islands*, on English charts.

island, not more than  $1\frac{1}{2}$  miles in circumference. We landed on the west side. It is covered with a thick growth of pandanus, and a few low cocoa-nut trees. Population about 50. The centre in lat.  $8^{\circ} 15' N.$ , long.  $167^{\circ} 25' E.$

This island was also seen by Capt. DUNN of the *Dragon*; he came within 5 miles of a small sand island with low bushes, 6 miles in circumference and inhabited, in lat.  $8^{\circ} 20' N.$ , long.  $167^{\circ} 46' E.$

*Position*.—Centre about lat.  $8^{\circ} 18' N.$ , long.  $167^{\circ} 27' E.$

**JASWAT**.—This island was seen by the brig *Elizabeth* in 1809, and is probably the Tebot of KOTZEBUE's chart, in about lat.  $8^{\circ} 22' N.$ , long.  $168^{\circ} 23' E.$  Dr. GULICK says the population amounts to about 50.

**NAMO**.—This atoll was seen by Capt. MOORE of the *Morning Star*, August 29th, 1857. He says—"Steered S.S.W. for the Menzikoff group: soon after daylight saw land right ahead: ran along the reef for 25 miles, and counted seventeen islands, all covered with verdure; they looked beautifully green and inviting, and are connected by a reef with large lagoons inside: doubling round the southernmost island, near in, saw several inhabitants. The water looking bold all along shore I ran within  $\frac{1}{2}$  a mile of it: saw no place to anchor, but there seemed to be a passage for a boat through the reef. The island lies in lat.  $8^{\circ} 42' N.$ , long.  $167^{\circ} 42' E.$ " Capt. MOORE called it **Dove island**; but Dr. GULICK names it Namu atoll. Population about 50.

KOTZEBUE gives a Namu atoll, centre in about lat.  $9^{\circ} 3' N.$ , long.  $167^{\circ} 27' E.$

**KWAJALEIN**.—An atoll of this name is given by Dr. GULICK, with the N. islet in lat.  $9^{\circ} 14' N.$ , long.  $167^{\circ} 2' E.$  It is certainly not identical with Catherine island, for, by following an erroneous authority, he has made an error of  $1^{\circ}$  of long. in the identification of the island: it is to be regretted that the missionaries have not given more of the positions determined by their own shipmasters. Population about 100.

KOTZEBUE has a Kwadelen in lat.  $9\frac{1}{2}^{\circ} N.$ , long.  $167\frac{1}{2}^{\circ} E.$

To correspond with the last two atolls, we have, on existing charts, **Menzikoff atoll**, following RAPER and the French chart No. 1153, and consisting of a double atoll (united by an isthmus) extending over 20 leagues, from lat.  $8^{\circ} 45' N.$  long.  $167^{\circ} 47' E.$ , to lat.  $9^{\circ} 19' N.$  long.  $166^{\circ} 15' E.$

On the Admiralty chart No. 2464, is a single atoll, 60 miles long, and 25 miles wide, the islands and islets exclusively on the S.W. side, and the whole extending from lat.  $8^{\circ} 38' N.$ , long.  $167^{\circ} 38' E.$  to lat.  $9^{\circ} 15' N.$ , long.  $166^{\circ} 48' E.$  The atoll is called **Quadelon** or **Ocean islands**—the N. islet, Catherine,—and the centre islet, Paterson; but if there be any value in figures, the ship *Ocean* never saw the group, nor are these the Catherine and Paterson islands of the brig *Elizabeth*.

The group was visited by H.M.S. *Serpent* in 1853; Capt. HAMMET calls it the Patterson group, and the N. islet, Catherine,—probably following the chart. No particulars of any value are given in the *Naut. Mag.* vol. for 1854, respecting this visit, not even the lat. and long.: "the vessel hove-to off a small village; a landing was effected from the boats,—wading over the reef for about 100 yards to get to the beach."

**LAM.**—This atoll was seen by Capt. BROWN of the *Morning Star* in December, 1858, and taken for a new discovery. "On coming up with it, found it to be a group of fourteen well wooded islands, encircling three sides of a beautiful lagoon, the western part being protected by a reef with a small channel: the lagoon is 4 miles across, and lies in lat.  $9^{\circ}$  N., long.  $166^{\circ} 26'$  E." Population about 500.

This is probably the **Paterson island** seen by the brig *Elizabeth* in 1809, and placed (S. point) in lat.  $8^{\circ} 56'$  N., long.  $166^{\circ} 38\frac{1}{2}'$  (by lunar), or  $166^{\circ} 28\frac{1}{2}'$  E. (by chron.). "This group of islands had a very fertile appearance, being one continued chain of cocoa-nut trees, lying W.N.W. and E.S.E.; low and well wooded." It may be the **Margaret island** of the *Ocean* (1804), placed in lat.  $8^{\circ} 52'$  N., long.  $166^{\circ} 15'$  E.

**UJAE.**—Respecting this atoll we have no information beyond the report of Dr. GULICK that it lies in lat.  $9^{\circ} 4'$  N., long.  $165^{\circ} 58'$  E., and thus may be the **Lydia island** of the ship *Ocean* (1804):—the **Catherine island** of the same vessel, in lat.  $9^{\circ} 14'$  N., long.  $166^{\circ} 2'$  E., may also be part of the same atoll. The population amounts to 500.

H.M.S. *Serpent* (1853) remarks, "On leaving this island (Paterson group) steered for the one mentioned by HORSBURGH as Catherine islands, and placed about 60 miles to the westward. . . . Saw a group of islands ahead; picking out the largest we hove-to and tried to land, but found it quite impossible to get through the reef, which consisted of a solid wall of coral, with 7 fathoms close to its edge, and 20 fathoms a boat's length off: a heavy surf was breaking on it, though on the lee side of the island. After running along the reef in the boat for 3 or 4 miles in search of an entrance without finding one, we gave it up and returned on board. Having just come from Catherine island, I consider this a distinct group, and may be called '**Serpent group**;' the position is that mentioned by HORSBURGH as Catherine island—viz., lat.  $9^{\circ} 14'$  N., long.  $166^{\circ} 2'$  E.;"—precisely so, this is Catherine island, and the Quadelon group of the Admiralty chart is *not* (see p. 241).

**Wottho or Watto atoll\*** is the **Schanz group** of thirteen islands, discovered by Capt. SCHANZ of the Russian ship *America*. They extend 12 to 14 miles (N.W. and S.E.), and are 5 miles wide—being tolerably well wooded; centre in lat.  $10^{\circ} 5'$  N., long.  $166^{\circ} 4'$  E. The population amounts to about 40.

The group was visited by H.M.S. *Serpent* (1853), but nothing of any moment was published respecting it,—beyond the fact "that there is landing on the largest: and that it resembles the Pescadores in every particular:" no lat. nor long. is given.

A group of islands, whaler's report, in lat.  $9^{\circ} 1'$  N., long.  $164^{\circ} 40'$  E., has no existence. Also, *Kabahaia* or *Kahabia island*, placed in lat.  $10^{\circ} 5'$  N., long.  $166^{\circ} 45'$  E., has no existence.

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\* Dr. GULICK remarks that Namu, Kwajelein, Ujae, Wottho, and Bikini require further examination.

**RONGELAB** or **RONG-LAB**.—This atoll was probably seen by WALLIS in 1767, which with another to the westward he took to be the *Pescadores* of ANSON's chart and of the early Spanish navigators; his observations placing it about a quarter of a degree too far west, or in long.  $167^{\circ} 21'$  E.

KOTZEBUE, on his second voyage, described it as a group of low, well-wooded coral islands, forming the usual circle round a lagoon; pleasant to look at but without inhabitants; centre, in lat.  $11^{\circ} 19' 21''$  N., long.  $167^{\circ} 24' 57''$  E.

It was surveyed by Capt. HUDSON (WILKES' U.S. Ex. Exp.) in 1841;—"It is of triangular shape and coral formation, having on its reef several islets, and some sand-spits; the former are covered with a few low bushes, but it has no cocoa-nut or pandanus trees, and affords nothing but the pearl oyster, and turtles, in the season. The whole atoll is about 32 miles in circumference. Its greatest length (N. and S.) is 10 miles, and the same between its east and west points. There are two entrances to the lagoon: one about the middle of the north side; the other on the S.W. side, south of the large islet. The island has no inhabitants, and is incapable of supporting any."

WILKES' chart shows each islet to be about a mile long; one on the east end, —another on the west side,  $3\frac{1}{4}$  miles south of the N. point of the reef, and in lat.  $11^{\circ} 21\frac{1}{4}'$  N., —the third, on the S.E. side, in lat.  $11^{\circ} 16\frac{1}{4}'$  N.\* The N. extreme is in lat.  $11^{\circ} 25\frac{1}{4}'$  N., and the S. extreme in lat.  $11^{\circ} 14\frac{1}{4}'$  N.—The easternmost islet is in lat.  $11^{\circ} 23\frac{1}{4}'$  N., long.  $167^{\circ} 36\frac{1}{4}'$  E.

H.M.S. *Serpent* visited the atoll in 1853, describing it as a number of islands, or rather sand banks, covered with stunted trees and jungle, connected together by reefs and surrounded by a coral reef. The lagoon was entered by the boats and the various islets visited: some natives were seen, and on one of the islets the jungle was intersected by paths which led into small clearings, where were a few huts. No springs or pools of fresh water could be seen. On entering the lagoon the surf was breaking very high on each side, and numerous sharks followed the boat, almost touching it. Dr. GULICK says the population is about 120.

On the Admiralty Chart this atoll is erroneously called Bigini, following KOTZEBUE; the native Bikini is more to the westward.

**Rimski-Korsakoff**, visited by KOTZEBUE on his second voyage, had probably been seen by WALLIS in 1767. KOTZEBUE estimated it to be 54 miles long in an E.N.E. and W.S.W. direction; but in reality it is the two atolls Rongerik and Ailinginae. Following KOTZEBUE, it is placed on the Admiralty and on French charts as Radokala or Rimski-Korsakoff.

**RONGERIK** or **Rong-rik** atoll is a rude quadrilateral, the sides facing respectively N.E., S.E., S.W., and N.W.; it extends 23 miles N.N.W. and S.S.E., and 25 miles N.E.  $\frac{1}{2}$  E. and S.W.  $\frac{1}{2}$  W., being about 78 miles in circumference. The islets and sand banks are on the S.E. and S.W. sides, the atoll being in other

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\* On WILKES' chart the E. islet is called Dowsette; the W. islet, Wallis; and the S.E. islet Brown; inside the lagoon, anchorage is shown off Wallis islet.

directions merely a reef; vegetation is as scanty as on Rongelab. The entrance to the lagoon is on the S.W. side, nearly 3 miles eastward of the westernmost islet, lat.  $11^{\circ} 14' N.$  The population amounts to about 80.

According to WILKES' chart, Kumi, the easternmost islet is in lat.  $11^{\circ} 26\frac{1}{2}' N.$ , long.  $167^{\circ} 10\frac{1}{2}' E.$  (according to KOTZEBUE,  $167^{\circ} 14\frac{1}{2}' E.$ ): Rimski, the southernmost islet, in lat.  $11^{\circ} 10\frac{1}{2}' N.$ , long.  $166^{\circ} 58' E.$ ;—the N. point of the reef, in lat.  $11^{\circ} 33' N.$ ,—the westernmost islet, Tufa, in lat.  $11^{\circ} 15' N.$ , long.  $166^{\circ} 47' E.$

**AILINGWAE** atoll lies 13 miles S.W.-ward from Rongerik; it is  $14\frac{1}{2}$  miles long. (East and West), and from 3 to  $4\frac{1}{2}$  miles wide; the islets are on its south side, as is also the entrance to the lagoon. The easternmost large islet is in lat.  $11^{\circ} 4' N.$ , long.  $166^{\circ} 35' E.$ ; and the W. point in lat.  $11^{\circ} 8\frac{1}{2}' N.$ , long.  $166^{\circ} 21\frac{1}{2}' E.$ ;—KOTZEBUE made it 5' more easterly.

It is uninhabited; vegetation very scanty.

**BEKINI**.—On his first voyage KOTZEBUE had noted this atoll as Udai-Milai; on second voyage (1825) he visited it, and named it *Machscheltz*; he states, however, that in regard to this island, or group of islands, he can say but little; it was blowing a heavy gale at the time, and he only saw the west side, which he placed in lat.  $11^{\circ} 40' N.$ , long.  $165^{\circ} 24\frac{1}{2}' E.$  CHRAMTSHENSKO only saw its western part.

Capt. MOORE (*Morning Star*, 1857,) was anxious to explore this group, from the fact that it is so little known, but it was blowing strong, with a heavy sea; he saw extensive reefs between two islands about 8 miles distant from each other; the land trending N.E. and S.W. A long reef ran out northerly, over which the sea broke with fearful violence: N.E. islet in lat.  $11^{\circ} 45' N.$ , long.  $165^{\circ} 40' E.$

Capt. BROWN (*Morning Star*, 1858) being close in shore, centre of S. part in lat.  $11^{\circ} 33' N.$ , long.  $165^{\circ} 37' E.$ , "could see twelve islands lying in an east and west direction. Being about the centre, stood for a channel 3 miles in width between two islands; on getting near, could see the bottom stretching across; sent a boat to sound and found 11 fathoms; sailed over, seeing very distinctly the various coloured corals comprising the reef under our keel as we dashed through. After passing this bar, found ourselves in smooth water; soon after saw land to the N.W., and also to the N.E., also a shoal with 10 feet over it;—of course I was now convinced that we had entered a spacious lagoon. I counted from aloft fourteen islands, and the lagoon must be 20 miles across at least. After standing out, we cleared the western extremity, which is a circular reef, at sunset; this part is very dangerous, as all the adjoining islets are small and very low—some of them having only a few bushes. I noticed one peculiarity in this group—the bars between the islands and shoals inside are more sunken than any we have seen heretofore; there are several deep channels into the lagoon." Population about 50.

**Brown group** and **Providence islands** although lying between three and four degrees westward of the Ralik chain are considered to belong to it, inasmuch as the natives on the various islets speak the Marshall island dialect.

**ENIWETOK** atoll was discovered by Capt. BUTLER in 1794, and received the name **Brown group**. LUTKE coasted for two days along its north and west sides, on which are about thirty low islands and islets, connected by a coral reef, and enclosing a lagoon. The group is circular, 20 miles north and south, 26 miles east and west, and about 75 miles in circumference; the islets are covered with a thick undergrowth, but wholly destitute of cocoa-nut or bread-fruit trees, and consequently uninhabited (Nov. 1827).

Dr. GULICK gives the population as 30.

*Position*.—The North islet, called Arthur, is in about lat.  $11^{\circ} 40' N.$ , long.  $162^{\circ} 15' E.$ ,—the S.E. islet, called Parry, in about lat.  $11^{\circ} 21' N.$ , long.  $162^{\circ} 25' E.$ ,—and the W. extreme of the atoll in lat.  $11^{\circ} 30' N.$ , long.  $161^{\circ} 58' E.$

**UJILONG**.—The ship *Providence*, in 1811, saw a group of islands and made them in lat.  $9^{\circ} 36' N.$ , long.  $161^{\circ} 8' E.$ ,—hence named **Providence** islands, and they were supposed to be the **Arrecifes** (near the same position) of the old Spanish navigators.

Capt. JAMES, of the *Morning Star*, visited the atoll in 1864, and describes it as "an irregular parallelogram in form, extending E. by S. and W. by N. about 12 miles; its width 5 to 6 miles: there are ten islands on the reef, the largest of which is near the east end; and there are two passages into the lagoon, on the south shore—the best of which is about 5 miles from the East point. There are few cocoa-nut trees, but the *pandanus* is more plentiful. *Position* of the centre of the atoll, lat.  $9^{\circ} 52' N.$ , long.  $160^{\circ} 56' E.$  Quite a large space in the centre of the island had lately been the scene of some convulsion of nature, apparently volcanic; the earth was thrown up in confused masses, and the trees around were broken and blasted as if from the effects of great heat without actual fire. On the lagoon shore lay a portion of the top sides of a vessel that had been many years a wreck."

In 1867 Capt. KEWLEY, of the *Dundonald*, saw the group, and landed on it, the ship being rounded to with the southernmost island bearing N.N.W. distant 2 miles. A boat was lowered, and "we rowed around along the shore for about 5 miles, until we came to a break in the reef, and immediately pulled for it, but on getting closer to it, found there was no possibility of crossing, owing to the water being too shallow. We then discovered that the reef was a bed of red coral, completely surrounding the island, inside of which the water was apparently about 6 feet deep, and as smooth as a mirror. We then pulled for the next island, which was connected with the first by a coral reef, but the water did not break on it; and when about a mile from the second island, saw the masts of two canoes lying inside the island. Feeling quite satisfied that if those canoes could get in we also could do so, we pulled along the island for about 2 miles, and then found an opening in the reef through which we passed, and found ourselves in the centre of a beautiful lagoon, with about 14 feet water, and the bottom perfectly clear, consisting of coral and other calcareous productions. We then went alongside of the canoes, but finding no natives in them, as soon as the boat was made fast, we fired a few shots in the air, having taken the precaution to arm ourselves before leaving the ship, and proceeded to a

large opening in the trees, keeping a sharp look out for any one that might be concealed in the bush. After walking about fifty yards inland, we came to a beautiful clear space of about 300 yards long, 80 or 100 broad, of which we took a good survey before proceeding further; not thinking it judicious to go into the bush, as there was quite space enough for a large number of natives to be concealed in it. Cocoa-nut trees were in abundance, with plenty of nuts in immense clusters, and the ground was strewn with those that had dropped down from the trees. There were a great many more trees of different kinds, but we could not find any other fruit, though we found a large basket full of potatoes just dug, so that it would seem the natives had been disturbed by our firing when coming on shore. The basket was made of the cocoa-nut leaf, and the potatoes were similar to ours, only very bitter in taste and very much like quinine. After spending about two hours looking over the island, we returned to the boat, loading her with cocoa-nuts, and regretting very much that time would not allow us to take a further survey. The *position* is, southernmost island, lat.  $9^{\circ} 47' N.$ , long.  $161^{\circ} 15' 45'' E.$  The group extends in an E. by S. and W. by N. direction for about 30 (?) miles, but cannot say what the extent is north and south, as I had no time to explore it properly."

Capt. RICHARD RICHARDS of the *Charlotte Jane* passed the group in 1868, and reported it as extending 12 miles W.N.W. and E.S.E.; possibly 7 to 10 miles in a north and south direction. There are several islets in the lagoon, and the reef on the north side runs out 3 or 4 miles beyond the islets. *Position*, lat.  $9^{\circ} 36' N.$ , long.  $161^{\circ} 14' E.$

Population about 1000.

As regards all the reports, the longitude appears to agree tolerably well; the greatest difference is in the latitudes, but probably Captains JAMES and KEWLEY's determinations are the best.

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The **RATAK** chain, according to Dr. GULICK, consists of the following atolls and groups—viz., Milli, Majuro, Arhuo, Aurh, Maloelab or Malo-lab, Erikub, Wotje, Likieb, Jemo, Ailuk, Mejit, Utirik, Taka, Bikar, and Taongi,—naming them in order from south to north.

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**MILLI**, the southernmost of the Ratak, was discovered by Capt. MARSHALL in 1788, and called the **Mulgrave** islands. Though not visited by KOTZEBUE, it is placed on his chart under the first name. DUPERRY passed its S.W. side in 1824, and gives a sketch of that part, showing a belt of islands and islets, situated on a reef, extending 10 miles in a N. by W. direction, and 8 miles in an E. by S.  $\frac{1}{2}$  S. direction, with land seen in the distance (to the eastward) from the masthead. The S.W. point was ascertained to be in lat.  $6^{\circ} 10' N.$ , long.  $171^{\circ} 50' E.$ , and the N. point of the belt (so far as seen) in lat.  $6^{\circ} 20' N.$ , long.  $171^{\circ} 48\frac{1}{2}' E.$

In 1848 Capt. DUTAILLIS, of the French corvette *Ariane*, entered and brought up within the atoll. He describes it as quadrilateral in form, with a double row of islands on the east side. Over an extent of 40 miles almost all the islands appear

connected at low water, so that at high water the reefs have barely sufficient depth on them to permit the passage of boats. He saw but one channel for large ships. In general the whole chain is steep-to on its seaward side, and the only accession to the size of the islands is now from the interior of the lagoon, where the disturbing causes are least effective. The area enclosed by the islands is a sea that may be traversed by ships of any size. The depth is generally from 21 to 27 fathoms, but here and there white patches show nearer the surface, and indicate where the anchor may be dropped, but certainly not with perfect safety, owing to the wear and tear of the coral rock. The best time to bring up is at low water. DUTAILLIS says he entered the lagoon between **Bar** island (on the east) and **Tokowa** island (on the west); the steep shore of the former must be passed tolerably close, as to the S.E. of it is a small patch over which the flood sets with a velocity of  $1\frac{1}{2}$  knots. This patch is indicated by strong rippings until half tide, but is nearly awash at low water. It is better to enter and leave with the tide, unless the breeze is sufficiently fresh to overcome the strength of the current. There is a boat channel between Anil and Buguenieu, the latter islet being the next one west from Tokowa; and the distance between the two channels is about  $1\frac{1}{2}$  miles. The current runs strongest between the largest islands. DUTAILLIS made his anchorage off Tokowa islet, in lat.  $6^{\circ} 14' 37''$  N., long.  $171^{\circ} 55' 50''$  E.

Lieut. KNOX (WILKES' "Expedition") passed the Milli, but no examination of it was made; the position of two small islets is given as lat.  $5^{\circ} 59'$  N., long.  $172^{\circ} 2\frac{1}{2}'$  E.; these are probably the S.E. end of the atoll (see p. 248), though on some charts they are represented as detached from it.

Capt. BROWN, of the *Morning Star*, found a fine ship channel on the north shore of the group, and entered the beautiful lagoon in a fresh gale and squally weather (Nov. 1858), and after shying about among the coral reefs, discovered a small cove under a beautiful island called **Jabunwani**. He ran in between the outer reefs and came to anchor, finding it a fine and secure place,—hence named Refuge cove. "The average height of the islands of this group does not exceed 5 feet above high-water mark, and they are only a few rods in width—say five minutes' walk. They are very beautiful, and many of them abound with bread-fruit, cocoa-nut, pandanus, and other trees. There are four deep-water channels, all on the north shore; one of them is a mile in width. The bottom is everywhere coral; at our anchorage the water was from 10 to 15 fathoms, and 25 fathoms was the deepest found in mid-lagoon. A vessel entering here must depend entirely upon her weight of metal, for such a thing as holding ground cannot be found. In all the lagoons I found high water at F. and C. to take place at  $3\frac{1}{2}$  h., with a rise of 5 feet—neap tides not over 2 feet. The seaward shores are bold and steep, having no outlying dangers."

Capt. BROWN also adds,—“On our arrival we attempted to enter the lagoon by a narrow channel, which we supposed was the only one, and through which a ship cannot pass inward while the Trades are blowing; working as near as possible, we anchored on the coral shelf, awaiting a chance to enter. I knew the tide was running flood at the time, and rising on the shore, but found it running out of the lagoon at the rate of 3 knots; this ran for nine hours, and we dragged off the shelf at sunset, leaving the tide running out still  $3\frac{1}{2}$  knots. This passage is in part to leeward, and when afterwards we found three deep channels to windward, into which

the Trade wind was driving the waters, we did not wonder at the pouring out to leeward."

The population amounts to about 700.

Capt. BROWN made the *position* of Jabunwuni islet, off which he anchored, in lat.  $6^{\circ} 20' N.$ , long.  $171^{\circ} 52' E.$ ; and the S.E. point of the atoll in lat.  $5^{\circ} 58' N.$ , long.  $172^{\circ} 2\frac{1}{2}' E.$

**MAJURO** was discovered by Capts. MARSHALL and GILBERT in 1788, and received the name of **Arrowsmith**. It is placed on KOTZEBUE's chart, but he did not visit it. CHRAMTSHENSKO (1829) states that the atoll is 18 miles long W.N.W. and E.S.E., and 11 miles wide. WILKES' brief remarks are that the atoll "is of coral formation, with a lagoon, and inhabited; it is 20 miles long; the S.E. end in lat.  $7^{\circ} 5' N.$ , long.  $171^{\circ} 23' 54'' E.$ "

Capt. BROWN states that "towards its eastern point the land is broken, and there is a small opening for canoes; but soon he found it continuous and unbroken for 24 miles, the reef and chain of islets being to the north. It is a magnificent island, with elegant forests of bread-fruit and pandanus. Cocoa-nuts of course abound, and bananas seem to be plentiful. On the shore of the lagoon the sight was delightful." He made the *position* of the W. point, lat.  $7^{\circ} 15' N.$ , long.  $171^{\circ} E.$

The population is about 1000.

**ARHNO**.—Capts. MARSHALL and GILBERT, in 1788, discovered what they considered two groups of islands, eastward of the Arrowsmith islands (Majuro); the westernmost received the name of **Pedder** and the easternmost **Daniel**; and the channel between Pedder and the Arrowsmith group was called **Fordyce passage**. On KOTZEBUE's chart they are called Arno, but he did not visit them. WILKES, U.S., 1841, briefly remarks—"Passed along the west side of Pedder island, and through Fordyce passage: Daniel island was also seen from aloft to the eastward: these islands are all of coral formation, with lagoons, and are inhabited." Dr. GULICK gives the native name as Arhno,—and appears to consider it a single atoll.

The U.S. chart places the S.W. point (Pedder island) in lat.  $7^{\circ} 11' N.$ , long.  $171^{\circ} 35' E.$ ; Admiralty chart No. 2464 gives lat.  $7^{\circ} 10' N.$ , long.  $171^{\circ} 40' E.$ ; French chart No. 1153, lat.  $7^{\circ} 5' N.$ , long.  $171^{\circ} 43' E.$

The U.S. chart places the N.E. point (Daniel island) in lat.  $7^{\circ} 30' N.$ , long.  $171^{\circ} 52' E.$ ; Admiralty chart gives lat.  $7^{\circ} 30' N.$ , long.  $172^{\circ} 2' E.$ , but the French chart places it 9' more to the southward.

**AURU**.—This atoll was visited by KOTZEBUE in Feb., 1817; he gives the native name as Aur, but called it **Traversey** after the Russian Minister of Marine. It had been previously noted on ARROWSMITH's chart as **Ibbetson** islands.

The atoll extends 13 miles N.W. and S.E.; its greatest breadth is 6 miles; and it consists of thirty-two islands. The N.W. island is **Pigeon**. Coming from Kawen and being to the east of it, "and under the lee in calm water, we proceeded at a short distance along the reef to discover a passage. We had scarcely sailed a mile when we found one about 50 fathoms broad, but so inconvenient that it could not be

passed without danger; notwithstanding this, our desire to examine it prevailed over every fear; the wind had abated a little, the weather was favourable, we spread all our sails and glided through it. We avoided, by skilful steering, some coral banks which we had not previously remarked, and had soon a view of the whole group, which seemed to us the smallest we had seen in these parts. We approached the island which forms the S.E. point of the group, and is called **Aurh**, and cast anchor under its protection. The lead was often cast in the middle of the group; we found the depth from 23 to 25 fathoms, over a bottom of live coral; at our anchorage the depth was 18 fathoms, though we were distant from the shore 50 fathoms.\* Finding this anchorage inconvenient, KOTZEBUE next day brought up in 8 fathoms, bottom of fine coral sand, off **Stobual**, 8 miles from Aurh, and which forms the N.E. point of the atoll. This islet is  $\frac{1}{2}$  a mile long, and a  $\frac{1}{4}$  of a mile wide, abounding in palm and bread-fruit trees, bananas, *taro*, &c. The latter anchorage is in lat.  $8^{\circ} 18' 42''$  N., long. (by lunar)  $171^{\circ} 12'$  E., by chron.  $171^{\circ} 8' 14''$  E.\*

The population amounts to about 1000.

**MALOLAB**, *Malo-lab*, or **Kaven**.—This atoll was discovered by MARSHALL and GILBERT in 1788, and named the **Calvert** islands; it is also the Bass Reef-tied group of BISHOP (1799) of the *Nautilus*. KOTZEBUE entered the lagoon in 1817, and gives the native name as Kaven, but calls it **Araktschayev**.

The atoll is 30 miles long (N.W. and S.E.),  $11\frac{1}{2}$  miles wide, and consists of sixty-four islands and islets. **Kaven**, the largest island of the group, is on the western point; near to it are two channels,—the larger close to the island, the other further south. In the larger channel are two shoals, a  $\frac{1}{2}$  of a mile apart; the depth in the middle is about 23 fathoms, over a bottom of live coral, and it regularly decreases to about 5 fathoms on either side; immediately inside the lagoon is a depth of from 20 to 30 fathoms. There is anchorage 5 miles N.E.-ward of Kaven, 200 fathoms from a small islet; but the depth is considerable; this anchorage is in lat.  $8^{\circ} 54' 21''$  N., long.  $170^{\circ} 52'$  E. (by chron.). Kaven island,  $2\frac{1}{2}$  miles in length and  $\frac{3}{4}$  of a mile in breadth, is in long.  $170^{\circ} 48' 33''$  E.

The depth of the middle of the lagoon is 32 fathoms, bottom of live coral, and it is only near the islands that a fine coral sand is found: no coral banks impede navigation as in Wotje lagoon.

**Tjan** or **Tyan** is a well-cultivated island, and only useful trees, such as the coconut, pandanus, and bread-fruit are suffered there. The anchorage off this island is in lat.  $8^{\circ} 52' 39''$  N., long.  $171^{\circ} 1' 31''$  E. (by chron.) High water at F. and C. at 4h. 35m., rise 5 feet.

**Torua**, which is twice as large as Tyan, is in lat.  $8^{\circ} 43' 10''$  N., long.  $171^{\circ} 9' 35''$  E.—Thence the atoll trends to the southward, and finally further S.E.-ward (the islands being generally small) to **Airik**, which is large (about the same size as Torua) and affords a more beautiful prospect than any of the other islands; there is excellent

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\* KOTZEBUE's positions may be regarded as very nearly, if not quite, correct: when he started from Honolulu, in Oahu, he made the long.  $157^{\circ} 52'$  W., or within  $1'$  of the latest determinations.

anchorage in 8 fathoms water, about 60 fathoms from the island, in lat.  $8^{\circ} 31' N.$ , long.  $171^{\circ} 10\frac{1}{2}' E.$  (by chron., but  $3'$  more W. by lunar); rise of tide 4 feet.

The S.E. island is in lat.  $8^{\circ} 29' 30'' N.$ , long.  $171^{\circ} 11' E.$

**Olot**, off which there is anchorage in 8 fathoms, coral sand, is in lat.  $8^{\circ} 46' N.$ , long.  $171^{\circ} 9' 42'' E.$  (by chron.)

The population is about 1000.

**ERIKUB**, one of the **Bishop Junction** islands of **MARSHALL** and **GILBERT's Chatham** group—Wotje being the other—was examined by **KOTZEBUE** in 1817, but he did not enter the lagoon, as he could not find the reported passage near the north end, and that which he saw on the S.W. side was dangerous, on account of the numerous turnings. He named it **Tschitschagov**.

Erikub is 24 miles long (N.W. and S.E.), and its breadth only 4 miles. Its whole circle consists of one reef, and contains but very few islands,—these being situated principally along its S.E. curve; the largest—near the S. point—is the only one with cocoa-nut trees (1817). It is uninhabited.

The current in the channel between Erikub and Wotje is very strong; **KOTZEBUE** says it "caused a loud roaring,—the waves towering like breakers over a shoal; but the lead did not reach bottom at 100 fathoms."

The centre of the atoll is in lat.  $9^{\circ} 6' N.$ , long.  $170^{\circ} 4' E.$

**WOTJE** or **WOTIE**.—This atoll was visited twice by **KOTZEBUE** in 1817; he remained there upwards of a month, and surveyed every part of it; he gives the native name as **Otdia**, but calls it **Romanzov**.

It is about 29 miles long (N. by E. and S. by W.), and has an average breadth of 10 to 11 miles. On the reef are sixty-five islands and islets,—principally on the north, N.E., and S.E. sides; these enclose a magnificent lagoon,—the openings into which are on the S.W. and south sides; this lagoon, though containing many rocky heads and shoals scattered here and there, is navigable for the largest vessels.

The northernmost entrance on the S.W. side is deep but dangerous,—the navigable track being seldom above 50 fathoms wide, constantly winding, and so situated that the Trade wind always blows out of it. The next entrance (called **Burick strait**, after **KOTZEBUE's** ship) is  $5\frac{1}{2}$  miles S.E.-ward of the W. point of the atoll, is 123 fathoms wide at the narrowest part, very deep outside and in the middle, with 26 fathoms inside, over a coral bottom;—on the north side of the channel is a small sandy islet.

**KOTZEBUE's** first anchorage was at what he named **Christmas harbour**, near the westernmost islands on the north side of the atoll, in lat.  $9^{\circ} 32\frac{1}{2}' N.$ , long. (by lunar)  $169^{\circ} 53' E.$ , (by chron.)  $169^{\circ} 46\frac{1}{2}' E.$  Here there is a depth of 10 fathoms over fine coral sand; to the north lay, at the distance of 2 cables, the reef which united the third and fourth islands; at the same distance to the east was a coral reef visible at low water, and the water was quite smooth even during the strongest wind. The view was confined in the east to the chain of islands; in the west was the reef round the outside of which they had sailed; in the south there was the clear horizon, for even from the mast-head the entrance to the lagoon was invisible. At the anchoring

place the water is so transparent that the bottom could be seen at a depth of 10 to 12 fathoms.

**Goat** island, the fourth reckoning from the westward, is covered in many places with an impenetrable wood; the pandanus is the most frequent tree, next to which is the bread-fruit; cocoa-nut trees are rare. For 7 miles further eastward there is no safe anchorage, for though the nature of the bottom and the depth are good, there is no protection from the eastward; there are many coral banks and heads southward from the chain of islands; close to the reefs which connect the islands the bottom is of fine sand, but opposite the islands it is of live coral. There is anchorage off the ninth island from the westward, but not so convenient as at Christmas harbour; a reef extending to the south protects it towards the east; this island is about the same size as Goat island, but higher.

To the eastward of the thirteenth island, and towards the centre of the lagoon, are many coral heads distributed here and there; the greatest depth is 31 fathoms, on live coral, but near the reef 10 to 12 fathoms on fine coral sand. The fourteenth island, called **Bird**, is 11 miles from the westernmost. The seventeenth island, called **Ormed**, is the northern point of the whole group,  $\frac{3}{4}$  of a mile from which there is anchorage in 15 fathoms on fine coral sand, and 20 miles from Christmas harbour; lat.  $9^{\circ} 33\frac{1}{2}'$  N., long. (by chron.)  $170^{\circ} 11'$  E.

**Wotje** or **Otdia**, the easternmost and largest island of the group, lies 8 miles E.S.E.  $\frac{1}{2}$  S. from Ormed, and is  $5\frac{1}{2}$  miles in circumference: bread-fruit and pandanus are here abundant, and the vegetable mould is good. At  $\frac{1}{4}$  of a mile off the island there is anchorage in 8 fathoms, over fine sand, in lat.  $9^{\circ} 28'$  N., long. (by lunar)  $170^{\circ} 16\frac{1}{2}'$  E.; water is here collected in pits. **Egmedie**,  $2\frac{1}{2}$  miles southward of Otdia, is a small island distinguished by a grove of old cocoa-nut trees situated in the middle of it, and rising much higher than all the other trees. This, the high Bird island, and another south of the anchoring place off Otdia, are three fixed points which present themselves to the navigator when he reaches the southern point of the group. The south point of the southernmost island is  $5\frac{1}{2}$  miles S.  $\frac{1}{2}$  W. from the south point of Otdia island; thence the reef trends westward, nearly 4 miles, and beyond another small island there is a channel through the atoll, called **Lagediak strait** by KOTZEBUE. The breadth at the narrowest part of this channel is 100 fathoms; its depth is irregular, decreasing from 20 to 5 and 3 fathoms in places, and the current runs out very strong with the ebb.

**Schischmarev strait** is the opening through which the *Rurick* departed from the lagoon; between it and Lagediak strait, from which it is distant  $2\frac{1}{2}$  miles in a westerly direction, are three islands; the channel is safe, and at the narrowest part 150 fathoms broad—very deep in the middle, and near the reef there are 11 fathoms; it is in every respect preferable to Rurick strait, as it is much wider, and permits the mariner to sail in and out with the usual Trade wind; Rurick strait, likewise, is not so easily found, as nothing is seen there but a continued reef, which is always alike; here, on the contrary, the passage between the two islands is to be seen even at a distance.

The atoll between Schischmarev and Rurick straits is mostly reef, with a few islands nearer to the former, between which there may be an opening or two, but this is uncertain.

The low land here has no influence on the atmosphere, and the barometer falls and rises as uniformly as it generally does between the tropics: the mean height during our whole stay varied but little from 29.7 inches; temperature 80° Fahr. The mean of our observations at Otdia gave for the time of high water, at F. and C., 2½ h.; the greatest difference in the height of the water was 7 feet (KOTZEBUE).

The population, according to Dr. GULICK, does not exceed 300.

**LIKIEB** was visited by KOTZEBUE in 1817; he gives the native name as **Liglep**, and calls it **Halden**; the islanders pointed out a passage into the atoll on the west side, deep and broad enough for the *Kurick* to enter, but he passed on, making it 14½ miles long, N.E. and S.W., and the centre in lat. 9° 51½' N., long. 169° 13½' E. "The natives of Likieb are tall, robust, and handsome men, by which they are advantageously distinguished from the other Ratakers. They live principally on fish, and are generally better off than the natives of the other atolls. When KOTZEBUE visited the group a second time he found it one-half larger than he had originally supposed, or about 20 miles long, with many islands on the reef,—those to the N.W.-ward being well covered with cocoa-nut trees: there are also two good channels into the lagoon—navigable with the usual Trade wind, and good anchorage inside. The N.W. point is in lat. 10° 3¼' N., long. 169° 2' E.

The population amounts to about 300.

**JEMO** or **YEMO**, the **Stepie** island of BISHOP (1799), was not visited by KOTZEBUE, but he gives the native name as **Temo**, and places it on his chart in lat. 10° 58' N., long. 169° 45' E.

The population numbers about 200.

**MEJIT** was discovered by KOTZEBUE on January 1st, 1817, and called on that account **New Year** island, but he gives the native name as **Miadi**. It is a low wooded island, 3 miles long (N. and S.), and ¾ of a mile wide, with a long reef extending northward on the north side. The lovely verdure of the island has a very pleasing look, but it does not produce much in the shape of provisions; the inhabitants are tall and well-shaped. The centre of the island is in about lat. 10° 8½' N., long. 170° 55½' E. The population does not exceed 50.

**AILUE**, possibly the **Tindal** and **Watts** island of MARSHALL (1788), was visited by KOTZEBUE, who gives the native name as **Ailu**, and calls it **Krusenstern**.

The atoll is 15 miles long (N. and S.), and 5 miles wide; the eastern side is formed by a chain of islands, but the western and southern sides are merely a coral reef. To the north are three channels into the lagoon, all deep, but two are *very* narrow, and the third only from 50 to 60 fathoms wide, but free from danger, and the reefs at the entrance resembling a wall, rise perpendicularly from the bottom: the lagoon, however, is very full of shoals and coral banks, and its greatest depth is 20 fathoms.

The south point is formed by **Ailuk** island, nearly a mile long, and a ¼ of a mile wide, and distinguished from the rest of the group by its high palm trees; off it is anchorage in lat. 10° 13' N., long. 170° 1¼' E.

**Kapeniar island**, to the north of the group, is about 4 miles in circumference, but produces little; there is anchorage off it, under its lee, at the distance of 50 fathoms, in a depth of 6 fathoms, bottom of white clay; lat.  $10^{\circ} 27\frac{1}{2}'$  N., long. (by lunar)  $169^{\circ} 59\frac{1}{2}'$  E. High water at F. and C. at 4h. 53m.; rise of tide 8 feet.

The population amounts to about 200.

The **Button islands**, discovered by MARSHALL and GILBERT in 1788, are supposed to be Taka and Utirik described below.

**TAKA** was visited by KOTZEBUE; he gives the native name as *Togai* and calls it *Suvarov*. It consists of small islets, principally on the east side, joined together by coral reefs which surround an apparently deep lagoon; the islets are thickly covered with trees, but not a single palm tree. Population about 20. KOTZEBUE places the S. point in lat.  $11^{\circ} 2'$  N., long.  $169^{\circ} 48'$  E.; Capt. MOORE, of the *Morning Star*, places the centre in lat.  $11^{\circ} 5'$  N., long.  $169^{\circ} 40'$  E.

KOTZEBUE found no passage broad and deep enough by which to enter.

The **Channel** between Taka and the next island to the north (Utirik) is  $3\frac{1}{2}$  miles in length. KOTZEBUE passed through it with the *Burick*, and found it free from rocks and very deep; position of channel, lat.  $11^{\circ} 11\frac{1}{2}'$  N., long.  $169^{\circ} 50\frac{1}{2}'$  E.

**UTIRIK**, to which KOTZEBUE gave the name *Kutusov*, is larger than Taka, and the islands are on the S.E. and south sides; the reef, without any islets on it, extends far to the northward, and is very dangerous. The N. point of the reef is in lat.  $11^{\circ} 29'$  N., long.  $169^{\circ} 54'$  E. Capt. BROWN, of the *Morning Star*, places the centre in lat.  $11^{\circ} 20'$  N., long.  $169^{\circ} 50'$  E. Population about 20.

Both groups together (Taka and Utirik) are  $25\frac{1}{2}$  miles long, north and south.

**BIKAR**, the northernmost of the Ratak chain, was discovered by Capt. MARSHALL in 1788, and received the name of **Dawson island**. KOTZEBUE did not visit it, though he made two attempts to do so; on each occasion being carried off his course by the strong westerly current. According to the statement he got from Kadu, "Bikar forms a circle, but consists for the most part of reefs, and contains only two small islands; a third is said to lie in the middle of the lagoon; all are overgrown with low bushes: there are small entrances on the lee side of the atoll for boats, which go there to catch turtle and seafowl. KOTZEBUE's chart places the centre in about lat.  $11^{\circ} 49'$  N., long.  $170^{\circ} 9'$  E. The atoll is uninhabited.

The *currents* are very strong and uncertain among the Ratak chain of islands (see p. 293), generally, however, to the westward. The *winds* are also very strong during the winter months of the northern hemisphere,—during which period heavy rain falls. "According to our observations the prevalent wind is E.N.E. It is, however, said that the wind in the months of September and October sometimes blows from the S.W., and not seldom rises into a furious hurricane, uprooting the trees and desolating the islands" (KOTZEBUE).

The poor and dangerous atolls of Ratak have nothing to attract shipping thither. Water is scarce everywhere, and fruit not very abundant. The lagoons do not

abound in fish, and several are considered poisonous; outside, about the reefs, and at the entrances, there are swarms of sharks, but they seldom penetrate into the inner seas. Rats are the great plague of all the islands, and destroy everything.

**TAONGI** or **Gaspar Rico** is included in this group, but it has been already described on p. 173.

*Mitchell islands*, a whaler's report, in lat.  $9^{\circ} 18' N.$ , long.  $175^{\circ} 30' E.$ , have no existence; nor has *Ellis group*, a whaler's report, in lat.  $8^{\circ} 27' N.$ , long.  $179^{\circ} 6' E.$

### GILBERT (OR KINGSMILL) ARCHIPELAGO.

The **Gilbert** or **Kingsmill archipelago** extends from lat.  $3\frac{1}{2}^{\circ} N.$  to  $2\frac{1}{2}^{\circ} S.$ , and between long.  $172\frac{1}{2}^{\circ}$  and  $177\frac{1}{2}^{\circ} E.$ ,—within which area is included sixteen groups of islands,—viz., Makin and Butaritari, Marakei, Apaiang, Tarawa, Maiana, Apamama, Kuria, and Aranuka, north of the equator; and Nonouti, Taputeuwea, Peru, Nukunau, Onoatoa, Tamana, and Arorai, south of the equator; in addition to which are included Banaba (Paanopa or Ocean island), and Nawodo (Onavero or Pleasant island), to the westward of long.  $170^{\circ} E.$ , the inhabitants of which speak the same dialect.

One of the easternmost groups, south of the equator, was discovered by **BYRON** in June, 1765. Captains **MARSHALL** and **GILBERT**, in the *Scarborough* and *Charlotte*, saw some of the northern groups in 1788; others were discovered by Capt. **BISHOP**, of the *Nautilus*, in 1799, and some were seen by the brig *Elizabeth* in 1809. Capt. **DUPERRY**, of the French corvette *Coquille*, visited and partially explored many groups in 1824; but the most complete account of the archipelago will be found in vol. v. of **Commodore WILKES'** "United States Exploring Expedition"—the larger part of the groups having been surveyed by Capt. **HUDSON** of the U.S. ship *Peacock*, and Lieut. **KNOX** of the *Flyingfish*.

The following preliminary remarks on the later *history* of the archipelago and on the *character of the people* are by Dr. **GULICK** :—

"It was **KEUSENSTERN** who gave the name of Gilbert to this archipelago, and who subdivided it into the three groups of **Scarborough**, **Simpson**, and **Kingsmill**, the last name including Taputeuwea (Drummond island) and all to the south of it, then very imperfectly known. In **Commodore WILKES'** "Narrative" the name Kingsmill was improperly extended to the whole archipelago, and this is now its usual designation among Americans and by American authorities.

"The archipelago consists of sixteen low coral islands, only two of which are destitute of a lagoon. It was the ten most northern islands that were explored, first by **DUPERRY**, and subsequently by Capt. **HUDSON**, of the United States Exploring Expedition; yet the remaining islands to the south are now scarcely less known, even geographically, owing to their waters being the resort of sperm whales, and consequently extensively visited during the last twenty-eight years by whaling vessels; and our knowledge of the whole group has greatly increased. Since the visit of the

United States Exploring Expedition these islands have also grown into some importance from their production of cocoa-nut oil. Many sailors have at different times resided on shore, and several have made their home there, particularly one respectable trader of rapidly increasing wealth named RANDALL; thus not an island of the archipelago but has been thoroughly explored.

"On the 6th of January, 1844, the *Columbia*, Capt. KELLEY, of New London, was wrecked on Nonouti (Sydenham island). The ship's company were roughly treated, but all were taken off in safety twenty-three days after. January 8th, 1848, the *Triton*, Capt. THOMAS SPENCER, of New London, was very nearly taken by the natives of the same island, under the leadership of a Portuguese; the captain and a boat's crew were detained on shore under very aggravating circumstances, but the Portuguese having been killed in the attempt to take the vessel, their lives were spared, and they effected an escape, with the consent of the natives, on the 19th of the same month. In 1850 the *Flying Fox*, Capt. BROWN, was also wrecked there; one of the mates, named WALKER, with the cooper and eight white men of the ship's company, and a Rotuma native, made the passage to Apamama (Simpson island); they were engaged in trade for cocoa-nut oil, but ere many months the cupidity and hostility of the natives being aroused, every one of the foreigners was killed, and since that time no white man has been allowed to reside among them.

"The whale ship *Ontario*, Capt. SLOCUM, of New Bedford, was wrecked on Makin (Pitt island), in January, 1852, but through the influence of Capt. RANDALL, resident there, no lives were lost, and much even of the oil was saved. In August of the same year, the island was visited by the Protestant Missionaries, then on their way westward to establish themselves on Kusaie and Ponapi.

"In November, 1857, a mission station was taken on Apaiang (or Charlotte island) by the Rev. H. BINGHAM, Jr., and a Hawaiian associate. In September, 1860, a second station was taken by two Hawaiians on the neighbouring island of Tarawa. The language has been reduced to writing, and a number of children are fluent readers. But the desire for knowledge has yet to be awakened in the minds of the masses.

"Nothing is more remarkable in the Gilbert archipelago to one who has visited other parts of Micronesia, than the great number of the people. Elsewhere the sparseness of the population is painful; but here the overflowing swarms are continually surprising one. The smallest of the atolls, Peru, whose diameter is not more than about 2 miles, has a population of from 1500 to 2000, and Aranuka has 1000, while Tapiteuwea has from 7000 to 8000. In almost every other part of Micronesia the houses are scattered, and if there are what may be termed villages, they are but small collections of houses and in no very close proximity to each other; while here the habit is to congregate in towns, where the houses are in nearly as close relation to each other as possible. These villages are—as is almost invariably the case on the low, annular islands—on the inner or lagoon shore; and as one lies at anchor within, the collections of low, white-roofed houses stretching along under the cocoa-nut groves, may be seen every few miles, the canoe sheds first, in a row along the beach, and then the dwellings, which are nothing more than roofs,

standing promiscuously just behind, usually with a large council-house in the midst.

"On landing, the swarms of children, guiltless of clothing, are perfectly surprising to one who has mourned over the desolations on Ponapi and Kusaie. The numbers of old men and women also are among the most pleasant objects seen, even though we know that the old women are the drudges. So prolific are they as yet on the greater number of the islands—so uncontaminated with foreign disease (1862)—that their population is deliberately limited by practising abortion to prevent too great a number of mouths—a reason denied by Mr. HALE. Their numbers are also shown by the sanguinary nature of their battles. The accounts given by WILKES, on the authority of his informants, are doubtless correct. Since the establishment of the mission on Apaiang a party of more than a thousand came over from Tarawa: many were slain on the flats while attempting to land; others were taken alive and held as slaves; while hundreds fled in their proas and were never more heard of—their houses standing to this day empty along the northern shores of Tarawa.

"By far the greater part of the population of Micronesia is congregated on this archipelago. There may be twenty or twenty-five thousand on the whole of the Mariana and Caroline islands, which added to the ten thousand of the Marshall islands makes perhaps thirty-five thousand; while on the Gilbert islands there are forty-five to fifty thousand, or more.

"In physical appearance the people are darker and coarser as a whole than the more western inhabitants of Micronesia. They are also a larger race, some of the chiefs being very corpulent, equalling in size the ancient chiefs of Hawaii. This is also the more remarkable from these islands being the most barren of the atolls of Micronesia. The cocoa-nut and pandanus, and a few laboriously cultivated *taro*, are the only vegetable productions, while the greater number of the low islands of the Marshall and Caroline archipelagos produce *taro*, bread-fruit, and jack-fruit in considerable abundance. It is probable, however, that these remarks apply rather to the inhabitants of the islands to the north of the equator, which is the portion that has fallen under my personal observation. Mr. HALE, of the United States Exploring Expedition, speaks of the natives of Taputenwea as of 'middle size, well made, and slender. . . . The usual height is about five feet eight or nine inches, but we saw many who were considerably below this standard. There are none of those burly persons among them which are so common in the Sandwich and Society islands, and we did not see one instance of obesity.'

"Nothing that I have seen would widely separate the Gilbert islanders from the other Micronesian races. There is the same slightly aquiline nose and prominent cheek bones and chin, and the same well developed cerebrum, particularly in the frontal and coronal regions. The hair has the same fine glossiness, and often curls. Yet it must be acknowledged that the Micronesian delicacy and perfection declines as we proceed southward in the group; and their language, both in its vocabulary and grammar, as was to be expected, has a greater affinity with those of Polynesia than any other Micronesian tongue.

"In manners and customs the people exhibit something of the same coarseness betrayed in their physical developments. The males go naked, save when they hold or rudely tie a small mat about them with a piece of rope or rope-yarn stolen or

begged from some ship. The matured females wear a cocoa-nut leaf fringe about six inches wide. They are pre-eminently indelicate and indecent, possessing very little, if any, of that refined gentility found on Ponapi. Many of their customs regarding the dead are abominably filthy and disgusting, such as preserving them for days and weeks and carefully daubing over themselves the froth or ooze from the mouth of the deceased. A wife will frequently for weeks after the death of her husband continue to sleep beside the corpse under the same coverlid; and a mother will sometimes carry the body of her infant about with her till it falls to pieces, and then she will cleanse the bones and carry them. Indeed, it is common to preserve the bones, particularly the skull, of the dead; and carry them about, at times carefully anointing them with oil, and even sharing food with them.

"Heathenism is here seen in some of its lowest and most disgusting forms; though it may be said in alleviation that there is little of that deliberate cruelty and none of that religious sacrifice of life found in many of the groups of the Pacific. Their religious rites differ in no material respects from those practised in other groups. Stones—the incarnations of deities—are found everywhere, some of which are so noted as to be the recipients of gifts of food and to receive the prayers of certain priests.

"On the greater number of the islands, particularly on those south of the equator, the government is of a very democratic nature. A man is of importance in proportion to the amount of land he possesses and the number of slaves he owns. Each head man is the representative of a family of brothers, sons, &c., who are more or less dependent upon him, and who are always ready to sustain him. The state is thus divided into large families, each jealous of the other and ready to thwart the ambitious pretensions of any one of their number. On some of the islands, however, a particular family has by a series of fortunate events, either in peace or war, or in both, so extended its relations as to be paramount; and its patriarchal head is consequently the nominal king of the island. Yet there may be other families so powerful on these same islands as to prevent the establishment of a monarchy. The nearest attempt at kingship is exercised on Apamama, including the two dependent islands of Kuria and Aranuka. On Apaiang a similar power is rapidly rising. On Maiana, Tarawa, Marakei, and Butaritari there are nominal kings, but their power is far from absolute.

"The officers of the United States Exploring Expedition judged the inhabitants of the islands south of the equator to be less amiable and kindly dispositioned than those to the north; while Captain Randall quite reverses the statement, and thinks the southern islanders much the cleverest and best natured. It is probable that the difference in the degree of government has something to do with the different judgments, and that the tendency to monarchism is greater in the more productive, and consequently more luxurious, islands of the northern portion.

"The capacities of this race are developed in three principal directions;—in the securing and preparation of food—in the erection of houses, particularly of their noble council houses,—and in the construction of their proas and the navigation of them.

"So limited are their resources that a very considerable degree of ingenuity is called forth in securing their food from land and sea, for, as on the Marshall islands,

by far the most important article of diet is the pandanus fruit. This is eaten raw when ripe, and even when green; it is also cooked and eaten fresh; and is also prepared with great labour for long preservation. The cocoa-nut furnishes them with the meat and water of the nut at all stages of its growth. From the meat of the nut thousands of barrels of oil are yearly manufactured by their own hands and sold to traders, who take most of it to Sydney. The meat of each nut is scraped by hand, and exposed to the sun for two or three days, when it is pressed under a long rude lever acting on a transverse log. Agents for the traders are found on each island, who pay the natives principally in tobacco and firearms. The cocoa-nut tree also furnishes them from its flower stem with a delicious sap that forms a most nutritious and healthy drink, especially for the children, who frequently get little else of aliment for days together. This sap ferments and intoxicates, often producing untold mischief and misery. And from it also, by boiling, they prepare a delicious syrup, which they keep in cocoa-nut shells hung up, frequently by hundreds, in their houses, and which they mix with water when their appetites or hospitality demand something especially delicate. But the cultivation of the *taro* makes the largest demand on their time, strength, and ingenuity. First, trenches or patches are dug down through the sands and stones to the underlying reef-rock. The fresh water oozes into these ponds in sufficient quantities to nourish the coarse, large-leaved varieties of *taro*. But the next step is to secure soil for it to grow in. For this purpose it is brought in baskets from wherever found, sometimes from miles distant. Frequently the soil is first sifted, to separate the worthless particles of stone. Even leaves of certain trees are carefully gathered and picked to pieces, and then placed about the *taro* roots to assist in forming a little soil. An almost incalculable amount of labour is thus spent on each root, and yet it is only raised in sufficient quantities to be considered a luxury. Much of it is very coarse and unpalatable, but there are also most admirable varieties, and some grow in the course of years nearly to the size of a barrel.

"In catching fish they are, as might be expected, remarkably expert, much of their sustenance coming from the sea. Probably that which I saw on Ebon would be nothing strange of this people, by necessity so ichthyophagous. A flying-fish was one day seen darting about over the flats near our house, where the water was not more than a foot in depth. Two youths darted out like arrows and commenced throwing stones, that fell beyond the fish, and so frightened it still nearer the shore. After having for a time in this way worried and partially fatigued the fish, the chase commenced. The fish's constant effort was to regain the deep water, which his two pursuers as persistently defeated; for, strange to say, the poor fish seems not to be able to use its wing-like fins save in the fathomless main. In less than ten minutes the fish lay passive in the hands of these expert fisher boys. I have seen a school of two or three hundred bonetas driven on shore and speared with such consummate skill that scarce an individual fish escaped." (Dr. GULICK.)

Besides fruit and vegetables, the food of the natives consists of fish, from the whale to the sea-slug; shell fish of every kind are also eaten. Turtle are taken in the season on the beach.—(WILKES' "U.S. Exploring Expedition.")

"Their council and dance houses loom up in the distance, the most prominent of all other objects on shore. Many of them are over an hundred feet long, nearly fifty

feet wide, and thirty to forty feet high. They are nothing more than immense roofs, reaching to within three feet of the ground, their eaves resting on large coral slabs. It is here they congregate on every public occasion,—in tumultuous rabbles of delight or anger. Here every public measure is carefully discussed, and here they dance and revel sometimes for many continuous days and nights.

"Their proas are as admirable as those of the Marshall islanders, the only important difference being that the keel is curved up fore-and-aft so as to form the segment of a circle; a canoe without its outrigger when looked at from one side is consequently the shape of a gibbous moon. At certain seasons they devote days to sailing miniature canoes.

"It may be gathered from such facts that they are an active, intelligent race, and that nothing in their intellectual parts need deter us from attempting their civilization. Their language, though of course destitute of innumerable terms for material objects they have never seen, is not found more deficient as a vehicle for moral truths than the mass of uncultivated dialects, and is probably more full in the necessary terms than many. In coming from the other portions of Micronesia here, we detect a greater difference lingually than between any of the other dialects with which we are acquainted. In the first place there is a far less variety of vowel sounds; and the palatal consonants *ch*, *j* and *sh*, with the dental *th* and *s* so frequent in the northern and western groups, are unknown here. It is this fact which admits of Hawaiians acquiring this dialect so much more readily than any other of Micronesia. An article is found here, elsewhere in Micronesia unknown. Yet in the use of suffixed or inseparable pronouns—which is the great peculiarity of the Micronesian dialects—this dialect is Micronesian."—(Dr. GULICK.)

**Winds and Climate.**—The following remarks on the winds and climate of the Gilbert archipelago are from WILKES' "U.S. Exploring Expedition":—

"The climate of these islands is equable, and though of high temperature, it is found to be less oppressive than in most tropical countries. For the most part constant breezes prevail, and frequent rain falls, which moderates the great heat, and at the same time confers fertility on the soil. From October to April, the time of the *Peacock's* visit, is the winter, and is especially distinguished by the frequency of rains. Variable winds from the Northward and Westward prevail at this season, and they have violent gales (typhoon-like) from the S.W. The natives plant stakes to prop up their houses, and tie them down to prevent them from being blown away. These storms last for two or three days, veering gradually to the North. The leeward sides of the islands receive most damage, and both land and trees are blown away. In these gales the trunks of large trees are thrown on the west side of the islands, together with large lumps of resin, similar to that found in the soil at New Zealand, which the natives use to scent their oils with: these trees, sometimes two feet in diameter, were thought to be of the pine species.

"From May to September the weather is fine, with clear skies, and only occasional showers; and during this time the wind blows constantly from the Eastward. This is the season in which the natives make their voyages; they never venture abroad in the winter months, even from island to island, being well aware of the danger of so doing."

Earthquakes are occasionally experienced.

Rats are plentiful here as at the Ratak group in the Marshall archipelago.

**MAKIN**, the northernmost group of the Gilbert archipelago, is a reef without a lagoon,  $6\frac{1}{2}$  miles long N.N.E. and S.S.W., and varies in width from  $\frac{1}{2}$  a mile at the south end to 2 miles at the north end. There is a large triangular island at the north end,—each side of which is about  $1\frac{1}{2}$  miles long. Towards the south end of the reef are two more, but much smaller, islands,—the southernmost, being about  $\frac{1}{2}$  a mile long. The N. extremity is in lat.  $3^{\circ} 20' 43''$  N., long.  $172^{\circ} 58'$  E.;—the S. point of the reef is in lat.  $3^{\circ} 15\frac{1}{2}'$  N. Population about 500.

**BUTARITARI** atoll is triangular, the apex being situated to the south, and it extends  $16\frac{1}{2}$  miles W.  $\frac{1}{2}$  N. and E.  $\frac{1}{2}$  S. The S.E. side is a continuous grove of cocoa-nut and pandanus, with some undergrowth; on the other sides is a reef, which is awash, excepting the N.W. point, where there is a small island and a boat entrance to the lagoon. The principal entrances, of which there are three, to the lagoon are on the S.W. side of the reef. The S. point is in lat.  $3^{\circ} 1\frac{1}{2}'$  N.,\* long.  $172^{\circ} 45\frac{1}{2}'$  E.;—the W. point is in lat.  $3^{\circ} 14'$  N., and the E. point in lat.  $3^{\circ} 9\frac{1}{2}'$  N. Population about 1500.

**Makin** is the **Pitt island** and **Butaritari** the **Touching island** of old charts; **WILKES** calls the latter **Tari-tari**. Both are probably under one government, and Makin is the residence of the chief or king.

The channel between the south end of Makin and the nearest part of the reef of Butaritari is  $2\frac{1}{2}$  miles wide.

**MARAKHI** was discovered by Capts. **MARSHALL** and **GILBERT** (1788), and received the name of **Matthew island**. It is  $5\frac{1}{2}$  miles long (N. and S.), and 3 miles wide at the south end,—being triangular, with the apex to the north. It is a lagoon island, but the land is continuous on every side,—the only break being on the N.E., but there is no passage. The N. point is in lat.  $2^{\circ} 3'$  N., long.  $173^{\circ} 25\frac{1}{2}'$  E.; the S. end is in lat.  $1^{\circ} 58'$  N. Population about 2000.

**APAIANG** is supposed to be the **Six islands** (Marshall, Allen, Gillespy Clerk, Smith and Scarborough) of Capts. **MARSHALL** and **GILBERT** in 1788; **KREUSENSTERN** called them the **Charlotte islands**, after Capt. **MARSHALL**'s ship.

It is a lagoon island, 16 miles long (N.W. and S.E.), and its average breadth is 5 miles. It consists of strings of coral islands and islets, situated on a reef which is 6 and 7 feet above the water. The reef has a bluff front, and is much worn by the sea: there is no coral sand. On the N.E. side the land is covered with cocoa-nut and pandanus groves, with some undergrowth. The N.W. as well as the S.W. sides are continuous reefs, 4 or 5 feet above the water's edge; on them are a few islets, and a large island near the westernmost point. About the centre of the reef, on the

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\* **WILKES**' Narrative says  $3^{\circ} 8'$  N., which differs from his chart; but there are other discrepancies between the charts and Narrative; therefore, in collating the description of the Gilbert archipelago, the preference has been given to the chart.

S.W. side, is a ship's channel into the lagoon, which is  $\frac{1}{2}$  a mile wide: near the entrance is a small islet which stands alone, and is a good mark.

The chart shows a second passage into the lagoon, 5 miles south-eastward of the one already described. Capt. MOORE, of the *Morning Star*, also says there is a safer one than that noticed by WILKES, and 5 miles distant from it, but he does not state whether it is N. or S. of the central channel as shown on DUPERRÉ's chart.

A native well on the islet near the entrance to the lagoon contains a small quantity of water, but it is flat and brackish.

The *Flying Fish* while surveying the lagoon got ashore near the south end; this was at the first of ebb, and she remained there till high water, the natives showing every disposition to attack and capture her. The *Peacock* was hove-to, to give assistance if necessary. At daylight, while lying-to, they drifted on a coral sand bank, where the ship was aground for a few minutes; their surprise was great when they found it was Tarawa on which they were ashore, on its N.W. side, and that they had drifted fully 12 miles by current to the southward during the night.

*Position*.—S. extremity, lat.  $1^{\circ} 44\frac{1}{2}'$  N., long.  $173^{\circ} 7'$  E.;—N. extremity (islet) lat.  $1^{\circ} 58\frac{1}{2}'$  N., long.  $172^{\circ} 58\frac{1}{2}'$  E.;—W. extreme, lat.  $1^{\circ} 53\frac{1}{2}'$  N., long.  $172^{\circ} 54\frac{1}{2}'$  E. according to WILKES' chart,—but DUPERRÉ makes the W. extreme in lat.  $1^{\circ} 54'$  N., long.  $172^{\circ} 47\frac{1}{2}'$  E.; Capt. MOORE (*Morning Star*) makes the Mission house in lat.  $1^{\circ} 50\frac{1}{2}'$  N., long.  $173^{\circ} 4\frac{1}{2}'$  E., agreeing tolerably well with WILKES.

The population amounts to about 3000.

**TARAWA**.—This atoll was discovered by Capt. MARSHALL and GILBERT in 1788, part being named *Knoy*, and part *Marshall island*. It was also seen by the brig *Elizabeth*\* in 1810, and called *Cook island*. It is *erroneously* called *Knox*, on some charts.

It is  $18\frac{1}{2}$  miles long (N. and S.), and 13 miles wide (E. and W.) at the south end, tapering to a point towards the north. The reef or west side is nearly a straight line (N. and S.), but the N.E. side runs N.W.  $\frac{1}{2}$  N., and S.E.  $\frac{1}{2}$  S. nearly 20 miles. The land, which is on the N.E. and South sides, is continuous and wooded, with the exception of four gaps where the reef is bare. On the south side near the western end are three hummocks (which appear like islands in the distance), and several small sandbanks, which are connected by the same reef. The lagoon has the appearance of an extensive bay, in consequence of the reef on the west side being a sunken one,—with from 2 to 10 fathoms water on it. At the distance of 6 miles North of the West point, in lat.  $1^{\circ} 27\frac{1}{2}'$  N., there is a good passage over the reef in 5 fathoms, and anchorage inside in the same depth.\*

The island is partially wooded, having several groves of cocoa-nut on it, and a dense undergrowth. It affords no supplies for vessels.

Population about 3500.

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\* The description given by the brig *Elizabeth* (1809) coincides with that by WILKES. "The S.E. side extends nearly East and West, 6 leagues; off the S.W. point a sandy beach runs to about a mile, with a heavy surf on it: over it, the land, extending some distance to the northward, with a deep bight, seemed to form a large bay on the west side: the land appeared one continued chain of cocoa-nut trees. Body of the island, lat.  $1^{\circ} 16'$  N., long.  $172^{\circ} 53'$  (by lunar),  $173^{\circ} 11\frac{1}{2}'$  E. (by chron.)

*Position*.—N. extremity, lat.  $1^{\circ} 38\frac{1}{2}'$  N., long.  $173^{\circ} 2\frac{1}{2}'$  E.;—S.E. point, lat.  $1^{\circ} 22'$  N., long.  $173^{\circ} 12\frac{1}{2}'$  E.;—W. point, lat.  $1^{\circ} 21\frac{1}{2}'$  N., long.  $173^{\circ} 0\frac{1}{2}'$  E.

**MAIANA**, probably the **Gilbert island** of **MARSHALL** and **GILBERT** (1788), and the **Hall island** of the brig *Elizabeth* (1809), was also visited by **DUPERREY** in 1824.

This atoll is a quadrilateral, the four corners being N., S., E., and W. From north to south it extends 11 miles—or 9 miles N.E. and S.W., and 6 miles N.W. and S.E.: the N.E. and S.E. sides are continuous land, whilst to the S.W. and N.W. it consists of a reef and bank, in some places awash; there is a sand-spit in its lagoon. The western sides of the atoll are very dangerous, and should be approached with caution, as the sea seldom breaks on them, and the discoloration of the water is not at all times to be observed. It affords neither refreshments, wood, nor water, but cocoa-nuts are abundant. On its west side on some of the banks, there is anchorage in from 10 to 15 fathoms water.

Population about 4000.

*Position*.—N. point, lat.  $1^{\circ} 2'$  N., long.  $173^{\circ} 4'$  E.; S. point, lat.  $0^{\circ} 51\frac{1}{2}'$  N., long.  $173^{\circ} 3\frac{1}{2}'$  E.; E. point, lat.  $0^{\circ} 58'$  N., long.  $173^{\circ} 8\frac{1}{2}'$  E.; W. point (reef), lat.  $0^{\circ} 55\frac{1}{2}'$  N., long.  $172^{\circ} 58'$  E.—**DUPERREY** made the S. point (close to which he passed) in lat.  $0^{\circ} 49'$  N., long.  $173^{\circ} 2'$  E.

**APAMAMA** is the **Hopper island** of **MARSHALL** and **GILBERT** (1788); probably also the **Roger Simpson island** of **BISHOP**, of the *Nautilus* (1799); and the **Dundas island** of the brig *Elizabeth* (1809).

In form it is quadrangular, and about 5 feet above the surface of the ocean: it is 10 miles long (W.N.W. and E.S.E.), and 5 miles in width (N.E. and S.W.). The land is continuous on the north and east sides, excepting two small strips of bare reef. There is anchorage near the centre of the W.N.W. side in an opening in the reef,  $2\frac{1}{2}$  miles northward of an island forming the west point of the atoll; the passage is about a mile wide, and the soundings vary from 2 to 5 fathoms; across it, in some places, the bottom is broken coral,—in others it is coral sand. The entrance to the lagoon, although feasible, should not be attempted through this passage; but there is a good channel into it, a mile wide, on the S.S.W. side of the island, and has from 5 to 7 fathoms water in it; it lies west of a small islet, near the centre of that side. A small quantity of fresh water may be had by digging on the beaches; wood and refreshments are not to be procured.

Population about 5000.

Maiana or Hall Island: (A) bearing N.  $10^{\circ}$  E. (true), dist. 6 miles (Duperrey).

*Position*.—N. point, lat.  $0^{\circ} 30\frac{1}{2}'$  N., long.  $173^{\circ} 54'$  E.; S. point, lat.  $0^{\circ} 21'$  N., long.  $174^{\circ} 1'$  E.; W. point, lat.  $0^{\circ} 25\frac{1}{2}'$  N., long.  $173^{\circ} 51'$  E.

**KURIA** was discovered by MARSHALL and GILBERT (1788), and named **Woodle island**; it was also seen by DUPERRÉ in 1824.

Its greatest length is a little over 5 miles (N.W. and S.E.), and its greatest width (which is at the S.E. end) 2 miles; the remainder is very narrow, and almost divided towards the centre. It is not an atoll; but the N.W. portion has two small lagoons, 200 or 300 yards from the beach: the water in them is not so salt as that of the ocean; in one of them the bottom consists of red mud on one side, while it is a white clay on the other; they are used as fish-ponds by the chiefs. A reef extends to the N.W. nearly 3 miles.

The island is but partially covered with trees, consisting of cocoa-nut, pandanus, and a few stunted bread-fruit. It has no outer reef, and may be approached very close. It affords neither wood, water, nor refreshments.

Population about 1500.

*Position*.—S. point, lat.  $0^{\circ} 12\frac{1}{2}'$  N., long.  $173^{\circ} 27\frac{1}{2}'$  E.; N. point, lat.  $0^{\circ} 16\frac{1}{2}'$  N., long.  $173^{\circ} 26\frac{1}{2}'$  E.; E. point, lat.  $0^{\circ} 13\frac{1}{2}'$  N., long.  $173^{\circ} 29'$  E.; N. extremity of projecting reef, lat.  $0^{\circ} 19\frac{1}{2}'$  N.—which coincide with DUPERRÉ's positions within  $1'$  or  $2'$ .

**ARANUKA** was discovered by MARSHALL and GILBERT (1788), and called **Henderville island**; it is probably the **Dundas** island of the brig *Elizabeth* (1809); DUPERRÉ passed close to it in 1824.

It is an atoll, nearly 7 miles long (east and west), and  $5\frac{1}{2}$  miles wide at the east end, diminishing to about 2 miles at the west end; there is apparently no channel into the lagoon. A reef, with rocky bottom, and having on it from 7 to 10 fathoms water, extends 2 miles beyond the West point, and runs along the N.W. side for 3 or 4 miles. The island affords neither wood, water, nor refreshments.

Population about 1000.

*Position*.—N. point, lat.  $0^{\circ} 13\frac{1}{2}'$  N., long.  $173^{\circ} 41\frac{1}{2}'$  E.; S. point, lat.  $0^{\circ} 8\frac{1}{2}'$  N., long.  $173^{\circ} 40\frac{1}{2}'$  E.; W. point, lat.  $0^{\circ} 11\frac{1}{2}'$  N., long.  $173^{\circ} 35\frac{1}{2}'$  E. DUPERRÉ makes the S. point in lat.  $0^{\circ} 5\frac{1}{2}'$  N., long.  $173^{\circ} 42\frac{1}{2}'$  E.

The channel between Kuria and Aranuka is 6 miles wide.

**NONOUTI** was discovered by Capt. BISHOP, of the *Nautilus* (1799), and has been called **Bishop** or **Sydenham island**, and



Kuria or Woodle island: (A) bearing N.  $36^{\circ}$  W. (true) dist.  $1\frac{1}{2}$  miles (Duperré).

Aranuka (Henderville Island): (A) bearing N.  $18^{\circ}$  W. (true) dist. 3 miles (Duperré).

the islets on it **Dog** and **Two Tree**, &c. It is probably the **Blaney island**\* of the brig *Elizabeth* (1809): DUPERREY examined the S.W. side in 1824.

The atoll is 19 miles in length, trending N.W. and S.E., and its width  $8\frac{1}{2}$  miles,—broadest at the N.W. end, terminating in a point to the S.E.-ward. The ledge of land is on the N.E. side; its lee or S.W. side is a reef, which, with the ledge of land, encloses the lagoon. Off the north point is a shoal extending  $1\frac{1}{2}$  miles to the northward and westward, the water on which is discoloured, and where the *Peacock* found 7 to 10 fathoms, rocky bottom. Also, on the S.W. and N.W. portions of the reef there is a coral bank, from 1 to  $1\frac{1}{2}$  miles beyond the reef, on which there are only 10 fathoms water. At the distance of four miles from the N.W. end of the island are soundings in 265 fathoms.

The island is partially covered with cocoa-nuts, pandanus, and other trees; and the islets of which it is formed are nearly continuous, connected by the usual coral reef.

From the north point there is a small island in sight, which may be DUPERREY's "Isle du Nord;" but, if so, instead of being located to the northward, as he has placed it, it bears nearly south of the north extreme of Nonouti. It was found, on proceeding towards it, to be a hummock, connected by a reef with Nonouti; but no *Sable* island could be seen: the tender passed round the opposite side of Nonouti, and did not see any island.† (WILKES.)

The population amounts to about 6000 or 7000.

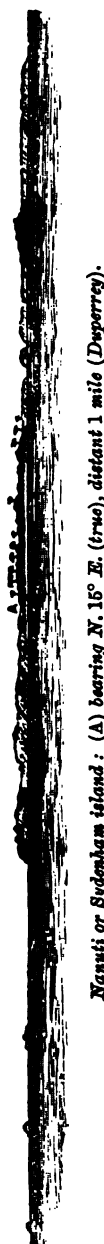
**Position.**—N. point (islet) lat.  $0^{\circ} 30' S.$ , long.  $174^{\circ} 20' E.$ ;—S. point, lat.  $0^{\circ} 45\frac{1}{2}' S.$ , long.  $174^{\circ} 30\frac{1}{2}' E.$ ;—W. extreme (reef), lat.  $0^{\circ} 35' S.$ , long.  $174^{\circ} 15\frac{1}{2}' E.$ —The position of the N.W. end as given by DUPERREY agrees tolerably well with that of WILKES, but the position of the S.E. end differs widely; he passed the latter at  $7\frac{1}{2}$  P.M., and there may possibly be an error.

**TAPUTEUWHA.**—This atoll was discovered by Capt. BISHOP of the *Nautilus*, in 1799, and he anchored for a short time off its west side in 18 fathoms water; it was called **Drummond island**. DUPERREY passed along its S.W. side in 1824, and made a running survey of it. It was the first of the GILBERT Archipelago, visited by the U.S. ships *Peacock* and *Flying Fish*, April, 1841.

It is of coral formation, 30 miles long in a N.W. and S.E. di-

\* Described as extending N.W. by W. and S.E. by E.; long, low, with abundance of cocoa-nuts.

† DUPERREY places I. du Nord (a mere islet) 8 miles, and another islet 3 miles, N. of the N.W. point of Nonouti; in his time it may have existed on the bank above described as extending from the N.W. point, and have been since washed away.



rection, and varies in width from  $\frac{1}{2}$  a mile to  $\frac{3}{4}$  of a mile: this, however, only includes the high portion, or that which is above the ocean level a few feet: it is thinly covered with cocoa-nut and pandanus trees, and not a patch of grass is to be seen, or any sort of shrubbery or undergrowth. To leeward, or on its west side, the reefs and sandbanks extend off some distance, gradually increasing from the N.W. point to the S.E., where they are as much as  $6\frac{1}{2}$  miles in width, enclosing a lagoon. This reef is interrupted in places; and there is good anchorage towards the N.W. end off the town of **Utiroa**, in 15 fathoms, in lat.  $1^{\circ} 13\frac{1}{2}'$  S., near a small sandbank which is usually bare. The whole shore of the island appeared covered with houses, presenting to the view one continuous village; at intervals of a mile were buildings of huge proportions—the council houses.

The lagoon is 5 fathoms deep in many places, white sandy bottom; but many sand and coral shoals are dry at low water.

The tender *Flying Fish*, got aground outside the reef, on a shoal in lat.  $1^{\circ} 24\frac{1}{2}'$  S.—The **Nautilus shoal** spoken of by BISHOP is possibly the S.W. extremity of the reef surrounding the lagoon, in lat.  $1^{\circ} 29'$  S., long.  $175^{\circ} 7'$  E., but DUPEREUX places it 5' more south, and 6' more westerly. If it refers to the reef on the N.W. extremity of the island,—then, the coral bank with 9 fathoms over it, extends from the N.W. point of the island  $1\frac{1}{2}$  miles beyond the reef which makes out from the point.

The food of the inhabitants consists of fish, cocoa-nuts, the fruit of the pandanus, *taro* and *api*.

Rats are very abundant; no land birds were seen but curlews, golden plovers, turnstones, noddies, and white terns. During the day of April 9th, the thermometer stood in the sun at  $159^{\circ}$  Fahr.

Population from 7000 to 8000.

Neither wood nor water can be obtained at this island; and there is no inducement to visit it, except to trade for a few cocoa-nuts and curiosities. Good whaling ground exists in the vicinity.

**Position.**—N. extreme of the island, lat.  $1^{\circ} 8'$  S., long.  $174^{\circ} 51'$  E.; —S. extreme of the island, lat.  $1^{\circ} 28'$  S., long.  $175^{\circ} 13'$  E.; —Anchorage, lat.  $1^{\circ} 13' 38''$  S., long.  $174^{\circ} 51' 34''$  E., to leeward of the reef.

The remaining islands of the Gilbert archipelago—to the southward—were not visited by the United States Exploring Expedition;—they are consequently not as well known as the islands that have been already described. As the positions given by WILKES and DUPEREUX correspond in the majority of instances within 1' or 2', it may be presumed that the various details connected with all the islands from Makin, southward to Taputeuwea, are tolerably accurate. Capt. HUDSON, of the *Peacock*, however, ascertained from the natives, with tolerable precision, the names of the islands further south;—

Taputeuwea or Drummond island: (B) N.E. (true) distant 10 miles (Duperrey).

and these are given in WILKES' "Narrative" as Peru (or Francis), Nukunau (or Byron), Arurai (or Hurd), Tamana (or Phœbe), and Onoutu (or Rotcher), and they approximately correspond with those spoken of by the missionaries. The positions given are by Capt. HANDY and V. SMITH, commanding vessels belonging to, or chartered by, the missionaries; but the part of the island is not always given.

**PERU atoll** is the **Peroat**, **Francis** or **Maria** island of earlier navigators and of ARROWSMITH's charts: its size is unknown.

The population amounts to about 1500 or 2000.

*Position*.—S. point, by Capt. V. SMITH, lat.  $1^{\circ} 25' S.$ , long.  $176^{\circ} 15' E.$ ;—by Capt. HANDY, lat.  $1^{\circ} 15' S.$ , long.  $176^{\circ} 6' E.$

**NUKUNAU atoll**, was discovered by Commodore BYRON in 1765, and named after him **Byron island**. He sailed along the S.W. side, and made it 4 leagues in length: it is low, flat, and well-wooded,—the cocoa-nut tree being most conspicuous: there was much foul ground in the vicinity, and a heavy surf.

Population about 5000 or 6000.

*Position*.—According to Byron, lat.  $1^{\circ} 18' S.$ , long.  $177^{\circ} 45' E.$ ; S. point according to Capt. V. SMITH, lat.  $1^{\circ} 25' S.$ , long.  $176^{\circ} 45' E.$ ,—according to Capt. HANDY, lat.  $1^{\circ} 25' S.$ , long.  $176^{\circ} 35' E.$

**ONOATOA**, or **ONERE atoll**, is possibly the **Clerk**, **Rotcher** or **Eliza island** of previous navigators. No particulars have been published respecting it.

Population about 4000.

*Position*.—S. point, by Capt. SMITH, lat.  $1^{\circ} 50' S.$ , long.  $175^{\circ} 30' E.$ ,—by Capt. HANDY, lat.  $1^{\circ} 55' S.$ , long.  $175^{\circ} 49' E.$

**TAMANA atoll** has frequently been reported by whalers as **Chase**, **Tamana** and **Phœbe island**, but generally in an erroneous position,—sometimes N. of the equator, and between  $176^{\circ}$  and  $176^{\circ} 46' E.$ : no particulars are known respecting it, beyond that the population amounts to about 3000.

*Position*.—S. point, by Capt. V. SMITH, lat.  $2^{\circ} 35' S.$ , long.  $176^{\circ} 15' E.$ ,—centre, by Capt. HANDY, lat.  $2^{\circ} 28' S.$ , long.  $176^{\circ} E.$

**ARORAI atoll** was discovered by the brig *Elizabeth* in 1809, and named **Hope** or **Hurd island**,—the position given being, lat.  $2^{\circ} 43' S.$ , long.  $176^{\circ} 56' E.$  (by lunar), or  $177^{\circ} E.$  (by chron.).

According to Capt. DUTAILLIS, of the French corvette *Ariane*, it is 6 or 7 miles long, and 1 to  $1\frac{1}{2}$  miles wide. [N.B.—Evidently this is exclusive of the lagoon.] It is low, well-wooded, and visible about 10 miles. It can be approached on its west side, and its south extremity terminates in breakers, which extend outwards 3 cables at least. The sea breaks heavily on the east face. At the N. point, and extending 4 miles, there is a bank of sand and rock, on which are  $3\frac{1}{2}$  fathoms water; it does not always break there, and hence the more dangerous.

DUTAILLIS says that the W. side of the island forms an extensive bay, where

whalers anchor; this is evidently a lagoon. The natives exchange fish, poultry, cocoa-nuts, &c., for tobacco, &c.

Population about 2000 to 2500.

*Position*, according to DUTAILLIS, N. point, lat.  $2^{\circ} 37' 24''$  S., long.  $176^{\circ} 56' 40''$  E.—S. point, lat.  $2^{\circ} 40' 54''$  S., long.  $177^{\circ} 0' 50''$  E., which may be tolerably correct, as his position of Makin atoll agrees within 1' of that given by WILKES.

**BAWABA** island was discovered by the *Ocean* in 1804, hence called *Ocean island*, and also *Paanopa*. The missionaries consider it to be an outlying member of the Gilbert archipelago.

It is quadrilateral in form, the angles facing the four cardinal points of the compass, and about 12 miles in circuit; it is high, especially in the centre, well wooded, has no lagoon, and may be seen about 20 to 25 miles. Capt. CHEYNE says there is neither harbour nor anchorage, and that it is steep-to all round, without any hidden dangers in the vicinity: in fine weather a landing may be effected on the N.E. part of the island, where there is a village. Capt. DUTAILLIS of the French corvette *Ariane* says that the north part of the island is scarcely approachable,—the beach presenting a cliffy front from 15 to 20 feet high; but the south part slopes towards the sea, and the sandy beach in that direction is favourable for landing. Cocoa-nut and fowls may be obtained here.

Population about 500.

*Position*.—Most of the reports, and they are many, agree in lat., but differ as much as 60' or 70' in long.:—Capt. CHEYNE made it in lat.  $0^{\circ} 50'$  S., long.  $169^{\circ} 48'$  E.; Capt. DUTAILLIS, in lat.  $0^{\circ} 52'$  S., long.  $169^{\circ} 44\frac{1}{2}'$  E. (misprinted  $160^{\circ}$ );—Capt. V. SMITH, lat.  $0^{\circ} 50'$  S., long.  $169^{\circ} 45'$  E.;—Capt. SPRAGUE (ship *Mercator*), lat.  $0^{\circ} 52'$  S., long.  $169^{\circ} 45'$  E.;—these appear to be the most probable, and the mean will be, lat.  $0^{\circ} 51'$  S., long.  $169^{\circ} 45\frac{1}{2}'$  E.

**PAWODO**.—This island was discovered by Capt. FERN in 1798, and named *Pleasant island*. It was probably reported as *Shank* island in 1801.

It is about 15 miles in circumference, rather low, covered with cocoa-nut trees, and of circular form. A fringing reef projects from the shore about 200 yards all round the island: it has neither harbour nor anchorage; is steep-to on all sides, and clear of hidden dangers. It is visible from aloft about 20 miles: on approaching it two round hummocks, some distance apart, are first seen. A good supply of cocoa-nuts and poultry may be obtained here.

Population about 1200.

*Position*.—Capt. FERN made it in lat.  $0^{\circ} 25'$  S., long.  $167^{\circ} 10'$  E.;—Capt. CHEYNE, in lat.  $0^{\circ} 25'$  S., long.  $167^{\circ} 5'$  E.;—Capt. HANDY, in lat.  $0^{\circ} 25'$  S., long.  $167^{\circ} 5'$  E.;—Capt. V. SMITH, in lat.  $0^{\circ} 25'$  S., long.  $167^{\circ} 20'$  E.;—Capt. BROWN (ship *Nightingale*) in lat.  $0^{\circ} 25'$  S., long.  $166^{\circ} 58'$  E.; *probable position*, mean, lat.  $0^{\circ} 25'$  S., long.  $167^{\circ} 7\frac{1}{2}'$  E.

Reports state that ships have been cut off, or attempts were made to do so.

both at Nawodo and Banaba. The natives are as fine a race as at the Gilbert archipelago; and indeed are closely akin to them, both in disposition, manners, and language,—therefore not to be trusted too implicitly.

Later observations (1867-1869) however speak more favourably of the islanders, and it appears that some English or Americans are resident among them, who visit passing vessels and carry off a small supply of fruit and pigs.

The following islands, reefs, &c., have been reported in the vicinity of the Marshall and Gilbert archipelagos:—

*Shank island* was reported in the same lat. as Nawodo, but in long.  $163^{\circ}$  E.,—perhaps a misprint for  $168^{\circ}$ .

*High island*, in lat.  $0^{\circ} 48'$  S., long.  $170^{\circ} 49'$  E., is most probably Banaba.

*Starbuck group*, reported on the equator, in long.  $173^{\circ} 30'$  E., and  $178^{\circ} 30'$  E. (evidently a misprint), is Aranuka atoll.

*Drummond island* and shoal, a whaler's report, on the equator, in long.  $174^{\circ} 50'$  E., is probably Nonouti.

*Nameless island*, in lat.  $2^{\circ} 50'$  S., long.  $170^{\circ} 18'$  E., has no existence in the position given.

A reef, on charts in lat.  $0^{\circ} 21'$  N., long.  $179^{\circ} 20'$  E., is probably an error, being the reef reported by Capt. PRITCHARD, U.S. consul at Apaiang, but in long. W. not E.

A reef, whaler's report, in lat.  $1^{\circ}$  N., long.  $179^{\circ} 24'$  E., is otherwise unknown.

#### JOHNSTON or CORNWALLIS, PALMYRA, SAMARANG, WASHINGTON, FANNING, AND CHRISTMAS ISLANDS.

**JOHNSTON or CORNWALLIS reef and islets** were discovered by Capt. C. J. JOHNSTON, of H.M.S. *Cornwallis*, in Dec., 1807, and the position given is lat.  $16^{\circ} 53' 20''$  N., long.  $169^{\circ} 31' 30''$  W. The locality was visited by WILKES' U.S. Exploring Expedition, and the description given is that of a reef which surrounded an extensive lagoon, extending N. and S. 10 miles, and in an opposite direction 5 miles. On it are two low islets;—the one to the westward was covered with bushes, but no trees; the other was a mere sand-bank. The reef is deep. The westernmost islet was found to be in lat.  $16^{\circ} 48'$  N., long.  $169^{\circ} 45\frac{1}{2}'$  W.

Lieut. J. M. BROOKE, of the U.S. schooner *Fenimore Cooper*, partially surveyed the reef and islets in 1859. It is a lagoon island, the reef being in the shape of an irregular quadrilateral,  $3\frac{1}{2}$  miles in a N. by E.  $\frac{1}{4}$  E. and S. by W.  $\frac{1}{4}$  W. direction,

and  $3\frac{1}{2}$  miles W.N.W.  $\frac{1}{2}$  N. and E. S.E.  $\frac{1}{2}$  S. On it are two islets,—the smaller being N.  $55^{\circ}$  E. (true) from the larger, and distant 1 mile. The larger islet is about  $\frac{1}{2}$  a mile long E.N.E. and W.S.W., and here (on the eastern side) are the huts and wharf of the Pacific Guano Company of San Francisco, who claim possession of it: a flagstaff marks its position from the distance. The smaller islet, a mere sandbank, is less than a  $\frac{1}{4}$  of a mile in diameter. Breakers extend to the North, nearly  $1\frac{1}{2}$  miles; to the West the reef approaches the larger islet within a mile. A bank surrounds the reef, extending in a S.E. direction 5 or 6 miles, with 10 to 15 and 20 fathoms on it.

*Anchorage.*—The best anchorage is  $\frac{1}{2}$  of a mile S.S.E. from the huts under the flagstaff on the larger island; in running for it the flagstaff should be brought to



*Johnston or Cornwallis island. Flagstaff N.N.W. distant 1 mile.*

bear N. by W.  $\frac{1}{2}$  W., though there is nothing to prevent its being brought on any bearing between North and N.W.

The sea all round the islets is alive with fish of a superior quality; and birds are extremely numerous.

Lieut. BROOKE made the flagstaff on the West islet in lat.  $16^{\circ} 44' 48''$  N., long.  $169^{\circ} 30' 6''$  W., which may be considered correct within 1' or 2', as the *mean of seven positions* (those of JOHNSTON, WILKES and BROOKE being included) places the island in lat.  $16^{\circ} 47'$  N., long.  $169^{\circ} 33'$  W. *Var.*  $7\frac{1}{2}^{\circ}$  E.

This is probably the *Maxos de Villalobos* of the old Spanish charts, placed in about lat.  $15\frac{1}{2}^{\circ}$  N., long.  $171^{\circ}$  W.

**PALMYRA** island was discovered by Capt. SAWLE, of the American ship *Palmyra*, in 1802. He described it as 14 miles in extent East and West, and about half that in breadth; flat; with a lagoon in its centre 7 miles long, in which the tide regularly ebbed and flowed; and uninhabited. The *Palmyra* anchored off the N.W. side of the island,  $\frac{1}{2}$  of a mile from the shore, in 20 fathoms. Turtle were abundant, but no fresh water could be found.

Formal possession was taken of the island by the American Guano Company in 1859; and by the Hawaiian Government in 1862. Capt. BENT, in his letter to the Hawaiian Minister of the Interior, reports that "the island is 10 miles in length, and 6 miles in breadth; the eastern end rises about 20 feet above the level of the sea; the landing-place is on the west end, and a vessel can lie in perfect safety in 3 fathoms water. The trees on the island are cocoa-nut, *puhala*, and a species of *koa*. All kinds of vegetables will grow on the island, and I planted some beans, corn, and water-melons. I erected a dwelling-house, and also a curing house for *biche-de-mer*, leaving one white man and four Hawaiians on the island."

*Position.*—Capt. SAWLE made Palmyra island in lat.  $5^{\circ} 50'$  N., long.  $162^{\circ} 23'$  W.;

subsequently it had been made in lat.  $5^{\circ} 49' N.$ , long.  $162^{\circ} 23' W.$ , and in lat.  $5^{\circ} 43' N.$ , long.  $162^{\circ} 20' W.$ ; Capt. BENT placed it in lat.  $5^{\circ} 50' N.$ , long.  $161^{\circ} 53' W.$  *Probable position*, lat  $5^{\circ} 50' N.$ , long.  $162^{\circ} 22' W.$ ,—but the *mean of all* will be lat.  $5^{\circ} 48' N.$ , long.  $162^{\circ} 15' W.$ \*

**SAMARANG islets and reefs.**—These were discovered by Capt. J. SCOTT, of H.M.S. *Samarang*, in 1840. He says, "These islets are a group of about fourteen or sixteen, forming a belt round an apparently shallow lagoon, and are covered with flourishing cocoa-nut and palm trees to the water's edge. In the centre of the eastern reef is a small dry sand bank; and the reef itself extends from the eastern islet nearly East, about 2 miles, over which the sea breaks heavily. Another reef runs out from the western islet about a mile to the westward; what distance they run in that direction I did not ascertain, but at 3 miles from the breakers on the western reef I sounded in 9, 8, and 7 fathoms, at which time the N.W. breakers were discovered from the fore-yard. By the angles that were taken, they stretch out full 9 or 10 miles to the N.W. from the western islet: the northern edge of the N.W. reef appeared from the masthead to run about S.E. by E. till it joined the eastern one: broken water was observed here and there along the whole line, with evident shoal water between it and the coral reef before mentioned.

"With the strong currents we experienced in this neighbourhood, a more dangerous spot to those navigating these seas can scarcely exist than this group of coralline islets, with their extensive reefs,—especially if unacquainted with their existence. Had it not providentially fallen calm during the night, the *Samarang* must inevitably have been lost, with the probability of every soul on board perishing, as our course would have taken us directly on to the reef." These currents were as follows:—

Sept. 11th, off Christmas island,	current S. $84^{\circ}$ W. 37 miles.
" 12th, lat. $2^{\circ} 28' N.$ , long. $158^{\circ} 48' W.$	" S. $80^{\circ}$ W. $11\frac{1}{2}$ "
" 13th, lat. $3^{\circ} 21' N.$ , long. $160^{\circ} 22' W.$	" West 25 "
" 14th, lat. $4^{\circ} 16' N.$ , long. $161^{\circ} 39' W.$	" S. $45^{\circ}$ W. 10 "
" 15th, Off Samarang islets	" none
" 16th, lat. $6^{\circ} 47' N.$ , long. $163^{\circ} 13' W.$	" N. $33^{\circ}$ E. 50 "
" 17th, lat. $7^{\circ} 42' N.$ , long. $163^{\circ} 52' W.$	" S. $72^{\circ}$ W. 25 "

*Position.*—Capt. SCOTT made the Eastern breakers of the Samarang islets to be  $4^{\circ} 38' 32'' W.$  of the N.W. point of Christmas island, hence the various *positions* are as follows:—Eastern breakers, lat.  $4^{\circ} 56' 15'' N.$ , long.  $162^{\circ} 10' W.$ ; Eastern islet, lat.  $4^{\circ} 56' 10'' N.$ , long.  $162^{\circ} 12' W.$ ; Western islet, lat.  $4^{\circ} 55' 9'' N.$ , long.  $162^{\circ} 14\frac{1}{2}' W.$ ; N.W. breakers, lat.  $5^{\circ} 0' 25'' N.$ , long.  $162^{\circ} 22\frac{1}{2}' W.$

**WASHINGTON island** was discovered by Capt. FANNING in 1798, the day after the discovery of the island to which he gave his own name; the position he assigned it was lat.  $4^{\circ} 45' N.$ , long.  $160^{\circ} 8' W.$  It was examined by WILKES' U.S.

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\* Palmyra island, without sufficient reason, has been supposed to be identical with Samarang island; the descriptions do not agree, and the great difference is in the latitude, not in the longitude.

Exploring Expedition, and is stated to be "3½ miles long by 1½ miles wide, and is entirely covered with cocoa-nut and other trees, exhibiting a most luxuriant growth. There is a reef off its eastern point, which extends for ½ a mile. At the western end a coral ledge extends 2 miles in a N.W. by W. direction, on which the water appears much discoloured, but the sea was not seen to break upon it except close to the point of the island. The height of the island above the sea is about 10 feet. The surf proved too heavy to allow of landing, and there is no anchorage." Its position is lat. 4° 41' 35" N., long. 160° 15' 37" W., according to WILKES' "Narrative," but 160° 11½' W. according to his chart.

Other positions assigned to Washington island at various times make it in lat. 4° 50' N., long. 160° 30' W.; lat. 4° 30' N., long. 159° 50' W.; and lat. 4° 43' N., long. 160° 14' W.; hence the mean of all will place it in lat. 4° 42' N., long. 160° 12' W.

**Fanning island** was discovered by Capt. FANNING in 1798, and subsequently visited by Capt. LE GOARANT DE TROMELIN, of the *Bayonnaise*, in 1828, as well as by others,\* but their observations have been superseded by the later remarks of Capt. MORSHEAD of H.M.S. *Dido* (1856), of Capt. PEARSE of H.M.S. *Alert* (1861), and of Capt. G. H. RICHARDS of H.M.S. *Hecate* (1863).

The island is occupied by an Englishman (Capt. ENGLISH) and his coadjutors, who employ Kanakas and other natives in the production of cocoa-nut oil; they carry on a profitable trade and hoist the British flag, having been placed under British protection on the visit of H.M.S. *Alert* in February, 1861.

**English point** (the settlement) is on the south side of entrance to English harbour, which is a limited and sheltered anchorage on the S.W. side of the island.

Fanning island is of coral formation, of the lagoon type, and in shape a rude oval 9½ miles long N.W. and S.E. Towards the centre it is about 3½ miles wide, but towards its south-eastern end 5½ miles; and its circumference is 27 miles. It is skirted by a small reef extending all round the island, but only to the distance of ½ a cable from the beach, and against this the ocean swell breaks—but seldom with any violence. Outside the reef there is no danger of any kind. The belt of land which forms the island has an average breadth of ½ a mile, and only at one spot—near its north end—does it exceed ¾ of a mile: it is densely covered with cocoa-nut trees, which produce fruit of the very finest description, but the regularity of the forest is occasionally broken by gaps, leaving thick clusters of trees standing apart,

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\* Capt. FANNING describes it as three islands, of which two are 9 miles long, and the other 6 miles; inhabited; lower than Washington island; a coral ledge extending 1½ miles along its west side under the shelter of which vessels might anchor.

Capt. LE GOARANT DE TROMELIN watered at the island, which he states to be 5 miles in diameter; nearly circular; slightly elevated above the sea and entirely covered with cocoa-nut trees. The island encloses a lagoon 3 miles wide, which communicates with the sea by a passage from 100 to 150 yards wide; the lagoon is obstructed by coral reefs to the surface of the water, leaving but a small space clear near the entrance (now English harbour). Fish of all kinds abundant; excellent water and a plentiful supply; firewood also to be had. (*Annales maritimes*).

with a low coral space between. One very conspicuous gap is near the N.E. point of the island, and the continuity of the belt of land is greatly broken there.

**English harbour.**—The lagoon is spacious, but generally shallow and full of coral heads. The entrance is near the centre of the S.W. side of the island, where the channel is about  $1\frac{1}{2}$  cables wide, but not navigable for large vessels over half that width. Just outside the entrance,  $2\frac{1}{2}$  cables W. by S.  $\frac{1}{2}$  S. from the flag-staff, the depths vary from 24 to 40 feet, decreasing to 15 feet and less towards the coral reef. The northern side of entrance is the shoalest, and the depth at  $\frac{3}{4}$  of a cable from the northern shore does not exceed 15 feet, but at  $\frac{1}{2}$  to  $\frac{1}{3}$  a cable's distance from the southern shore the depth is 30 and 32 feet. Inside is a tolerably extensive basin which affords safe anchorage, in 28 and 30 feet water, bottom of coral and sand, with the flag-staff on the south side of entrance bearing S.W.  $\frac{1}{2}$  S. distant  $1\frac{1}{2}$  cables. This is English harbour, which Capt. MORSHEAD said would be an invaluable spot for a rendezvous. The holding ground is good, and there is sufficient room for several vessels when properly moored to lie in perfect safety. Further in the soundings decrease to 16 and 12 feet, and there are besides several shoal spots; beyond these there is again deeper water, but to what distance the chart does not show.

**Tides.**—It is high water at F. and C. at 6h.; springs rise 3 feet; the stream in the harbour turns at high and low water, and runs from 4 to 5 knots.

**Caution.**—Vessels should not attempt to enter this harbour except at slack water.

**Whaleman anchorage.**—There is excellent anchorage for ships on the west side of the island, towards the N.W. end, and  $2\frac{1}{2}$  miles N.W.-ward of the entrance to English harbour; it is called Whaleman anchorage or bay, but has no title to the latter denomination. The depth of water is said to range from 8 to about 15 fathoms at  $\frac{1}{2}$  a mile from the beach. Here ships of the largest class have at times anchored to procure a supply of fresh water, which is abundant adjacent to the anchorage.

**Winds.**—The Trade-winds blow steadily from the eastward almost all the year round, and the island is seldom or never the scene of any boisterous weather. The months of March and April are generally the worst.

**Position.**—Capt. RICHARDS made the flag-staff, on the south side of entrance to English harbour, in lat.  $3^{\circ} 51' 26''$  N., long.  $159^{\circ} 22'$  W.; hence point Alert (the east extreme of the island, near which there is a gap in the continuity of the coconut forest) is in lat.  $3^{\circ} 52'$  N., long.  $159^{\circ} 15'$  W.; the North extremity of the island in lat.  $3^{\circ} 56\frac{1}{2}'$  N., and nearly on the meridian of the flag-staff in English harbour; and the South extremity in lat.  $3^{\circ} 48\frac{1}{2}'$  N.\*

**Supplies.**—The island is very fertile and produces bananas, pumpkins, *taro*, figs, melons, cabbages, radishes, tomatoes, and numerous other garden vegetables, introduced by the settlers. Every facility is offered for procuring firewood and water, as well as any fruit and vegetables in season, and the visits of whalers for this purpose are not infrequent. Fish is abundant in the lagoon.

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\* These positions may be relied on as correct:—H.M.S. *Dido* made English harbour in lat.  $3^{\circ} 49'$  N., long.  $159^{\circ} 19'$  W.; H.M.S. *Alert*, in lat.  $3^{\circ} 49'$  N., long.  $159^{\circ} 20'$  W.; others within 1' or 2' of the same position.

Bound from Honolulu and the northward make the island on the east side and sail round the south side. Ships must be careful on entering the harbour, as the coral reefs project further seaward there than elsewhere; but probably a pilot can be procured.

Whalers' observations generally place this island too much to the eastward, some as much as 30' and 40'; Capt. LE GOABAND DE TROMELIN assigned it a position one degree to the eastward. Only one recorded position places it 17' too far westward.

**CHRISTMAS** island was discovered by Capt. Cook, Dec. 24th, 1777, in the prosecution of his voyage northward from the Society islands, and just previous to his discovery of the Sandwich islands. Approaching it, he found it to be "one of those low islands so common in the Pacific—that is, a narrow bank of land inclosing the sea within: a few cocoa-nut trees were seen in two or three places, but in general the land had a very barren appearance. . . . As we kept our Christmas here, I called this discovery Christmas island. I judge it to be about 15 or 20 leagues in circumference. It seemed to be of a semicircular form; or like the moon in the last quarter, the two horns being the north and south points, which bear from each other nearly N. by E. and S. by W. 4 or 5 leagues distant. The West side, or rather the little islet at the entrance into the lagoon, upon which we observed the eclipse of the sun, lies in lat.  $1^{\circ} 59' N.$ , and long.  $157^{\circ} 30' W.$ , determined by a considerable number of lunar observations, which differed only 7' from the time-keeper, it being so much less.

"Christmas island, like most others in this ocean, is bounded by a reef of coral rocks which extends but a little way from the shore. Farther out than this reef, on the west side, is a bank of fine sand extending a mile into the sea. On this bank is good anchorage in any depth between 18 and 30 fathoms. In less than the first mentioned depth the reef would be too near; and in more than the last, the edge of the bank would not be at a sufficient distance. During the time we lay here, we had always a great swell from the northward, which broke upon the reef in a prodigious surf.

"The soil of the island in some places is light and black, evidently composed of decayed vegetables, the dung of birds, and sand. There are other places again where nothing but marine productions, such as broken coral, stones, and shells are to be seen. These are deposited in long, narrow ridges, lying in a parallel direction with the sea-coast, not unlike a ploughed field, and must have been thrown up by the waves, though at this time they do not reach within a mile of some of these places. This seems to furnish an incontestable proof that the island has been produced by accessions from the sea, and *is in a state of increase*. Not a drop of fresh water was anywhere found, though frequently dug for. We met with several ponds of salt water which had no visible communication with the sea.

"There were not the smallest traces of any human being having ever been here before us; and, indeed, should any one be so unfortunate as to be accidentally driven upon the island, or left there, it is hard to say that he could be able to prolong existence. There is, indeed, abundance of birds and fish; but no visible means of

allaying thirst, nor any vegetable that could supply the place of bread, or correct the bad effects of an animal diet; which, in all probability, would soon prove fatal. On the few cocoa-nut trees upon the island, the number of which did not exceed thirty, very little fruit was found; and, in general, what was found, was either not fully grown, or had the juice salt or brackish. So that a ship touching here must expect nothing but fish and turtles; and of these an abundant supply may be depended upon. On some parts of the land were a few low trees, under which sat infinite numbers of a species of tern; there were also frigate-birds, boobies, tropic-birds, curlews, sand-pipers, land crabs, small lizards, and rats."

Cook found soundings of from 40 to 20 and 14 fathoms water, over a bottom of fine sand, to the northward of the south horn of the crescent—the least depth about  $\frac{1}{2}$  a mile from the breakers, and the greatest about 1 mile; his first anchorage was near this spot, in 30 fathoms, but landing was impracticable as the sea broke in a dreadful surf all along the shore. His second anchorage was about  $1\frac{1}{2}$  leagues to the north of this, "in 20 fathoms, over a bottom of fine dark sand, before a small island that lies at the entrance to the lagoon; and on each side of which there is a channel leading into it, but only fit for boats: the water in the lagoon itself is very shallow." Here the landing place was good.

The next account of Christmas island is from Capt. J. SCOTT, of H.M.S. *Samarang*, in 1840. He describes it as "low, covered with stunted bushes, and with a few cocoa-nut and palm trees here and there; large lagoons were seen from the masthead in the centre of the island, like other islands of the same coral formation. From the S.E. to the S.W. point the line of coast runs N.W. by W.  $\frac{1}{2}$  W. 25.8 miles. A deep bay runs to the northward from a point of land about  $13\frac{1}{2}$  miles from the S.E. point. Close to the S.W. point are two or three groves of cocoa-nut trees (which from the sea appear as one) planted by Cook on its discovery. From the S.W. point the land trends N.E. (*true*),  $4\frac{1}{2}$  miles, forming a small bay, in the N.E. part of which is the anchorage,  $\frac{1}{2}$  to  $\frac{3}{4}$  of a mile from the shore, sand and coral,—9, 8, 7, and 6 fathoms. No turtle was seen, although Cook on his visit found a superabundance. From the N.E. point of this bay the land appears to run away East into a deep bight, and then trends away again to the W.N.W. in a narrow slip, terminating in the N.W. point, which bears nearly North, 7 miles from the S.W. point."

The latest notice of Christmas island is that given by Capt. HOOPER, who was despatched thither in 1858 from the Hawaiian islands, with the brig *John Dunlop* and schooner *Dolphin*, to look after the wreckage of the *J. C. Fremont* (a lumber laden barque), which had been lost there in November, 1857. He says "the shape of the island is that of a horse-shoe, with a spur of land running out from the south-eastern side: the centre forms a large bay or lagoon, having at the mouth a small island (Sandy island, where Cook observed the eclipse), on each side of which is a passage, through which very small vessels can enter; but they rarely do so, as the anchorage in the north passage is a safe roadstead, with the wind blowing off shore."

The S.E. part of the island is covered with numerous small lagoons or lakes of salt water, through which the exploring party had to ford. The water was so acrid from evaporation and the heat that it was impossible to remain in some of them; on dipping the hand in the water and drying it, a crust of salt covered it.

"After seven days' search the wreck of the *Fremont* was discovered in the large open bay on the eastern side of the island, formed by the point of land running out to the S.E. It lay beached, high and dry, but not easy of access. Having collected the lumber, the horses, drays, and carts (taken with them) were ready for transporting it over the land. From the wreck it was carted about 7 miles, then rafted over a lake 5 miles across, carted another mile, and then rafted again across the bay to the brig. In crossing the lagoon a sand bar,  $\frac{1}{2}$  a mile wide, was found stretching across its entire length, and which was dry at low water, but had about 12 to 15 inches on it at high tide.

"At each end of the lagoon a camp was erected; near to one of these tolerably good water (though somewhat brackish) was found by digging, and the horses drank it freely; but the animals were speedily knocked up, and became lame, owing, probably, to the heat and the use of the water, as well as from the want of grain. Grass was plentiful, such as it was, and this the horses preferred to the hay taken for them.

"On the S.W. point of the island is a grove of cocoa-nut trees, numbering perhaps six hundred; on the north side of the bay and lagoon are two or three clusters; and one towards the S.E. point. The most distant clusters cannot be seen the one from the other, as they are 25 miles apart, and the island is much larger than it is generally supposed to be. In the large S.E. bay, where so many wrecks occur, there is no anchorage; the water is very deep close to the shore, with a strong tide and surf setting on it. The land is not over 10 feet above the sea level in any part, and cannot be seen from a ship's deck more than 8 to 10 miles off. Navigators should, therefore, be cautious in approaching it.

"Great numbers of birds exist on the island, as also of turtle; in the bay near the wreck the fish are so abundant and tame that, sitting on the beach with a hook and line, fine large fish could be hauled in as fast as the hooks were baited.

"Pieces of the wreck of the *Briton*, lost twenty years previously to the visit of the *Dolphin*, were found upwards of 600 feet from the present shore, and the land has probably made out that distance since the wreck occurred. This appears satisfactory evidence that the island is extending its limits.

"A singular circumstance noticed was that the fish, in the large lagoon near which the camps were erected, were all dead, and in passing over the water in a boat they could be seen at the bottom; also on the lee shore of this lake the fish were piled up in a state of preservation; on being broken in two they were as sweet and wholesome as possible. The water of this lake is extremely salt, and stronger than any pickle ever used in curing fish or meat.

"Salt of the finest quality is very abundant on the banks of some of the lagoons; ship loads could be found, but not easily got to the anchorage."

Thus, from the account of Capt. HOOPER, it would appear that the island has considerably increased in size since the days of COOK, and that it is still increasing—probably by gradual elevation;—and also that from the S.E. to the N.W. end is not under 35 to 36 miles.

*Position.*—Capt. SCOTT's position of Christmas island is as follows (corrected):—S.E. point, lat.  $1^{\circ} 40' 34''$  N., long.  $157^{\circ} 9'$  W.;—S.W. point, lat.  $1^{\circ} 51' 54''$  N.,

Capt. HARVEY, of H.M.S. *Havana*, made the longitude of the N.W. point of Christmas island  $157^{\circ} 20' W.$ , or, as he observes,  $12'$  eastward of Cook's. By a strange coincidence the mean between his longitude and that given by Capt. SCOTT (viz.,  $157^{\circ} 38' W.$ ) is  $157^{\circ} 29' W.$ , again nearly coinciding with Cook's position.

*Rain* falls in light showers not unfrequently. Heavy showers are rare, and rainy days are unknown in my experience there. During four winter months at Baker island, from October 1st, 1859, to February 15th, 1860, rain fell twenty-three times, generally occurring in light showers or squalls, at intervals of a week or thereabouts, and a general coincidence between the times of occurrence of these showers and the changes of the moon from phase to phase has been observed, but this regularity is not so great, neither at this or other seasons, but that weeks have passed without a drop of rain. During these four months the least of these showers measured by conical rain gauge, amounted to 0.005 inch on a level, and the greatest on December 19th, 1859, was 0.258 inch. From December 14th, 1859, to December 20th, 1859, inclusive, there fell 0.65 inch. The total amount of the four months' rain was 1.840 inches, of which 0.85 fell in December. Although the amount of rain falling in the summer months is much less than that which falls in winter, there are, nevertheless, days in summer on which showers have fallen as heavy as any in the year. Rain falls most frequently in the night and just before daybreak; sometimes by day, especially if the sky has long been overcast, a rain cloud passes over the island, but I have often observed the remarkable phenomenon of a rain squall approaching the island, and just before reaching it, separating into two parts, one of which passed by on the north, the other on the south side, the cloud having been cleft by the column of heated air rising from the white coral sands.

The position of these islands near the equator and their remoteness from any high land make them favourable places for studying the meteorology of this region. The *equatorial current* is a matter of great interest. It has a general direction of west-south-west, and runs with great velocity, sometimes exceeding 2 knots per hour, and, at times, suddenly changing and running quite as rapidly to the eastward.

During the winter months there are days when the swell is very heavy, and the surf breaks violently on the reefs, but in summer there is little or no surf, and especially on the lee side of the island the water is very smooth. These periods in the winter occur usually at intervals of a few days, and prevail during two or three and sometimes more days. In this connexion I may allude to the shifting sands at Baker island, which, as I observed there, change their place twice in the year. The western shore of the island trends nearly north-east and south-west; the southern shore east by north. At their junction there is a spit of sand extending out towards the south-west. During the summer the ocean swell, like the wind, comes from the south-east, to the force of which the south side of the island is exposed, while the western side is protected. In consequence, the sands of the beach that have been accumulating during the summer on the south side are all washed around the south-west point, and are heaped up on the western side, forming a plateau along the beach two or three hundred feet wide, nearly covering the shore platform, and eight or ten feet deep. With October and November comes the winter swell from north-east, which sweeps along the western shore and from the force of which the south side is in its turn protected. Then the sand begins to travel from the western to the southern side, and after a month or two nothing remains of the great sand plateau but a narrow strip, while on the south side the beach has been extended 200 or 300 feet. This lasts until February or March, when the operation is repeated.

The three islands are without fresh water, and are almost destitute of vegetation.

From fifteen to twenty varieties of *birds* may be distinguished among those frequenting the island, of which the principal are gannets and boobies, frigate birds, tern, noddies, petrels, and some game birds, as the curlew, snipe, and plover. The tropic bird, so abundant on Howland island, is rarely seen on Baker or Jarvis islands.\* The frigate birds are the great producers of guano.

*Rats* were found on all the islands, especially on Howland island, where they had become astonishingly numerous; on Jarvis island they were comparatively fewer. A small *lizard* was also abundant on Howland island. (HAGUE.)

**HOWLAND** island was first reported by Capt. G. E. NETCHER, of New Bedford. According to Mr. J. D. HAGUE it is about  $1\frac{1}{2}$  miles long by  $\frac{1}{2}$  a mile wide, containing, above the crown of the beach, an area of some 400 acres. The highest point is 17 feet above the reef and 10 or 12 feet above the level of the high tide. It trends N.N.W. and S.S.E.

The general features of the island resemble those of Baker. Its surface, at least on the western side, is somewhat depressed, and much of it is covered by a growth of purslain, grass and other vegetation like that on Baker island, but considerably more abundant. Near the centre of the island there are one or two thickets of leafless trees or brushwood, standing eight or ten feet high and occupying an area of several acres. The tops of these trees, in which the birds roost, are apparently quite dead; but the lower parts, near the roots, show signs of life after every rain. The windward side of the island is formed by a succession of ridges composed of coral debris with some sand and shells, running parallel to the eastern beach, each one of which may, at earlier stages of the island's growth, have successively formed the weather shore. Occasionally among these ridges a sandy bed is met with in which some little guano is mixed. On the lee side there is also a sandy margin of considerable width. Bits of pumice and pieces of driftwood are scattered all over the island's surface.

The main deposit of guano occupies the middle part of the island, and stretches, with some interruptions of intervening sand, nearly from the north to the south end. Its surface is even, and in many places covered by a thick growth of purslain, whose

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\* The birds are probably much scarcer now that the islands are more frequented. KOTZEBUE during his Voyage of Discovery into the South Sea, &c., 1815-1818, must have passed very close to Baker and Howland islands, and he inferred the existence of land in the vicinity, from the numerous birds seen in every direction. He says, "May 8th, 1816, lat.  $3^{\circ} 14' 34''$  S., long.  $168^{\circ} 25' 33''$  W.; yesterday, and still more to-day, we observed a number of sea fowls, of different kinds, which, after sunset, directed their flight to the S.W. I did not doubt, from great numbers of sea fowls, but we were in the neighbourhood of many uninhabited islands and rocks; and if time had permitted, I should have followed the flight of those fowls, and steered S.W.; but the current, which we found setting N.W., carried us in that direction, daily, from 33 to 45 miles, and continued so until we had crossed the Equator on the 11th, in long.  $175^{\circ} 27' 55''$  W. On the 12th of May we were in lat.  $1^{\circ} 17' 46''$  N., long.  $177^{\circ} 5'$  W., when besides numerous sea fowls of various descriptions, we observed one land bird; but as land could not even be descried from the mast-head, it is to be presumed that it must lie very low."

thread-like roots abound in the guano where it grows. The deposit rests on a hard coral bottom and varies in depth from six inches to four feet. The fact, as observed at Baker island, that vegetation flourishes most where the guano is shallow, is also quite apparent here, and the consequent characteristic difference between the guano of the deep and shallow parts is distinctly marked. The first variety, from the deeper part, is a fine pulverulent substance of reddish brown colour, usually a little damp in its native bed, and almost quite free from roots of fibres. The latter is of rather coarser texture, quite black, and containing many delicate roots and fibres, and much vegetable matter. (HAGUE.)

*Position* :—This island has been named Howland and Holland ; and the following positions have been assigned to it. Howland island, lat.  $1^{\circ}$  N., long.  $176^{\circ} 50'$  W. ; Holland island in lat.  $1^{\circ}$  N., long.  $176^{\circ} 20'$  W. ;—an island in lat.  $0^{\circ} 41'$  N., long.  $176^{\circ} 20'$  W. ;—Holland island in lat.  $0^{\circ} 50'$  N., long.  $176^{\circ} 52'$  W. ; a new island in lat.  $0^{\circ} 45'$  N., long.  $176^{\circ} 35'$  W. ; Howland island, lat.  $0^{\circ} 51'$  N., long.  $176^{\circ} 32'$  W. ; Howland island in lat.  $0^{\circ} 43'$  N., long.  $176^{\circ} 30'$  W. and  $176^{\circ} 33'$  W. ; Howland island, lat.  $0^{\circ} 43'$  N., long.  $176^{\circ} 33'$  W. :—hence, probable position, and mean of all, lat.  $0^{\circ} 50'$  N., long.  $176^{\circ} 34'$  W.

**BAKER** island presents the usual features of an ordinary coral island, and is surrounded by a fringing reef, which is from 200 to 400 feet wide and slightly elevated above the sea level at low tide. It is about 1 mile long and  $\frac{3}{4}$  of a mile wide, trending East and West. The surface is nearly level, the highest point of which is 22 feet above the level of the sea, showing some evidences of elevation.

Above the crown of the beach there is a sandy ridge which encircles the guano deposit. This marginal ridge is about 100 feet wide on the lee side of the island, and is there composed of fine sand and small fragments of corals and shells mixed with considerable guano ; on the eastern or windward side it is much wider, and formed of coarser fragments of corals and shells which, in their arrangement, present the appearance of successive beach formations. This margin is partially covered with a rank growth of long, coarse grass, *portulacca mesembryanthemum*, and a few other species of plants. Encircled by this ridge lies the guano deposit, occupying the centre and the greater part of the island. The surface of this deposit is nearly even, but the hard coral bottom which forms its bed has a gradual slope from the borders towards the centre, or, perhaps more properly, from northwest to southeast, giving the guano a variable depth from 6 inches at the edges to several feet at the deepest part. None of the grass that grows abundantly on the margin is found on the guano, but there are one or two species of *portulacca* occurring in certain parts, (particularly where the guano is shallowest and driest), and to this is owing the presence of the fine roots and fibres in some of the guano. (HAGUE.)

*Position* :—This island has been variously reported as Phœbe, New Nantucket, Tamana, and Baker in the following positions :—It was seen in 1845 by Capt. DUFOUR of the *Faune*, when in lat.  $0^{\circ} 11'$  N., long.  $176^{\circ} 22'$  W., but he does not give his distance from it ;—Phœbe island, ? (New Nantucket) lat.  $0^{\circ} 20'$  N., long.  $176^{\circ} 59'$  W. ;—Phœbe island, ? (New Nantucket) lat.  $0^{\circ} 20'$  N., long.  $176^{\circ} 20'$  W. ;—Phœbe island, lat.  $0^{\circ} 12'$  N., long.  $176^{\circ}$ – $177^{\circ}$  W. (H. Foster) ;—New Nantucket island, lat.  $0^{\circ} 11'$  N., long.  $176^{\circ} 20'$  W. ;—Baker island,

lat.  $0^{\circ} 15' N.$ , long.  $176^{\circ} 21' W.$ ;—Baker island, lat.  $0^{\circ} 13' N.$ , long.  $176^{\circ} 22' W.$ ; —Baker island, lat.  $0^{\circ} 13' N.$ , long.  $176^{\circ} 22' W.$  (J. D. HAUVE). *Probable position*:—Lat.  $0^{\circ} 12\frac{1}{2}' N.$ , long.  $176^{\circ} 22' W.$ ; American authorities place it  $2\frac{1}{2}'$  more to the north.

From a rough sketch made on the island it appears to be (in outline) of an irregular quadrilateral figure, with a slight projection to the N.W., and another to the S.W. —giving the west side the appearance of a small open bay; on this side is an entrance for boats, immediately opposite to which is the temporary hotel, and close to it (to the northward) is the wharf. In the centre of the island are the patches of guano, with tramways to the largest deposits. Outside of the reef the downward trend of the island under water is so abrupt that an anchor will not grapple, but falls away towards the bottom of the deep ocean. For this reason it has been found necessary to anchor large buoys outside the reef, to which the guano-ships can moor themselves while receiving their cargoes. Each buoy is made fast by means of two iron cables. One of these cables attaches the buoy to a large sheet anchor; the other passes from the shore along the bottom to the anchor, and prevents it from sliding down the steep declivity into unfathomable depths.

The air above the island is alive with birds, which swarm like the flies of Egypt's plague; and, as you near the shore, you hear, above the sound of the ocean, their discordant din, which is to echo in your ears by day and night as long as you remain upon the island. Many of them by day range on tireless wing over leagues of ocean in quest of fish. But still the number of those that remain about the island is so great as to defy computation, and as you pass their haunts in some places they rise in such clouds as actually to darken the air above you.

On Sunday no unnecessary work is done, but the labourers are allowed to take a boat and fish in the shoals, where large fish, sometimes of 50 pounds or more and of remarkable beauty, are taken with the hook, the bait used being the flesh of the birds of the island. The esculent qualities of these fish do not fulfil the promise of their beauty. The ocean in this latitude is the haunt of a race of murderous sharks, which swarm about a ship with greedy and persistent devotion. These sharks are, by hereditary proclivity, man-eaters; and the white man who comes within their reach is snapped at in an instant by a score of ravenous mouths; but, strange to say, a dark skinned Polynesian will swim about in their midst and rarely be molested; a native of the Hawaiian islands fearlessly jumps from the bow of a ship into the midst of a 'school' of these fellows, swims, with the end of a line in his mouth, to one of the buoys, and returns to the vessel uninjured.

*Winds*.—The S.E. trade-winds blow steadily for seven or eight months, during which time landing on the west or lee side of the island is comparatively safe. From November to March or April the winds are variable and frequently tempestuous, rendering the island almost inaccessible, and putting an end to all work.

The latest remarks on the island are those furnished to the *Mercantile Marine Magazine* in 1869 by Mr. CHARLES REEVES, mate of the *Lock-na-Garr*:—

"The wooden houses upon the island, to the number of twelve, can be seen 14 miles from the mast-head; but if a ship should be at the buoy there, she can be seen long before the island. On approaching the island, care should be taken not to be set to leeward by the current, which constantly sets W.S.W., 2 knots an hour. If

a ship once gets to leeward she may be a week or more before she is able to beat up to the island again.

"As soon as the island is visible, the jack should be hoisted at the fore-royal-mast-head, and as a matter of precaution, the royal taken in, to make certain of the jack being seen, for many whalers pass the island and make their numbers, and should the jack not be seen the ship would be mistaken for a whaler, and no preparations made to receive her until too late. When made out as bound to the island, the American ensign will be hoisted from the signal-staff if it is favourable for coming to the buoy; but, should the ensign not be hoisted by the time the ship is close to the island, it is a sign that there is too much danger to bring up; therefore be prepared to haul to the wind when they hoist up 'Stand to Sea,'—and carry all possible sail to hold your own against the current.

"But when the ensign is hoisted, get up your best lines to run to the buoy; sometimes they have lines at the island, but just as frequently as not they have been carried away, and you must depend on your own. Steer for whichever end of the island will give you the weather gage, for you will have to luff round the lee side of the island to the buoy. The Mooring-Master comes on board when the vessel is about 2 miles from the island, and takes charge.

"There were three buoys laid down, and perfect in December, 1867; but in that month the *Minehaha* was lost, and took one mooring down with her, the buoy of which floated ashore; another was dragged into the surf, so that there was only one trustworthy in 1868; it is laid in 80 fathoms, and when a ship is swung off-shore she will have 135 fathoms under her stern. A chain is attached to the moorings underneath the buoy and made fast to the shore, which prevents the moorings drifting out to seaward; another chain is shackled to the moorings beneath the buoy and led to the ship's windlass. When a ship comes to the buoy, divers go down for the end of this chain, which is hove up on board-ship. After mooring, strong ropes should be led (through blocks on the jib-boom) to the buoy to heave it clear of the ship's bows, for the under-tow frequently sets the ship over the buoy, in spite of the sails being aback; and the rivets sticking out half an inch from the buoy make sad havoc with her copper. Lead a good spring to the buoy as soon as possible; I found the starboard side the best for that. Do not furl the after sails; keep the mizen topsail set. After furling the other sails, stop them with rope yarns, and take the gaskets off. By canting the after yards, and hauling out the spanker, you may by great watchfulness keep the ship end-on to the buoy as long as there is any wind.

"The Easterly winds are frequently interrupted by squalls from westward, more especially from November to March.

"As soon as dark clouds are observed gathering up to westward, do not hesitate a moment, but slip at once before the easterly wind fails. If you are tempted to hang on and the easterly wind does fail, the ship swings round, and nothing can save her from destruction; the wreck-strewn island bears melancholy evidence of this,—the beach being covered with spars that floated ashore, the only remains of the numerous ships which have been lost here: the hulls slide down the reef into deep water.

"It frequently happens during the winter months that a heavy surf sets in all

round the island. It would then be advisable for the ship to go to sea if there is any wind to slip, for there is no communication with the island except by signal, and there is great risk of the ship being lost.

"The *Loch-na-Garr* during one of these periods of surf was unable to slip, and tailing in towards the shore, the anchor was lowered down with 75 fathoms of chain, which we had afterwards to slip, being unable to heave it up again.

"On being made fast to the buoy, send ashore three months' provisions, and the clothes and effects of the officers and crew,—a lighter comes off for that purpose. Double lash every thing on deck, for the ship will roll fearfully; and have rolling tackles on all the yards.

"The disposal of the ballast will give no trouble; but do not throw overboard too much in case you should have to slip before getting sufficient Guano on board to stiffen the ship—for you must carry all sail while on the slip. The *Loch-na-Garr* had to slip with 300 tons in each end and none in midships; and was three weeks before she got any more.

"The guano is free from smell, and like brown dust in appearance; it is sent off in bags, 16 to the ton, in flat bottomed lighters carrying from 15 to 80 bags—according to the state of the surf.

"On arriving alongside, the crew have to go into the lighter to discharge her, unless you make an agreement with the Kanakas to lift it on the stage, which they will do for 5 cents a ton. The bags are emptied and returned by the same lighter; do not keep any on board, or a stoppage (owing to want of bags ashore) will be the consequence, for they have but a limited number to work with.

"If favourable weather should continue, a ship will load rapidly. I have taken in 125 tons in one day. The *Loch-na-Garr*, 1318 tons register, of which ship I was mate, took in 1900 tons of guano in 103 days—from January till March, 1868—the worst months in the year; during that period she was six times on the slip—a total of 47 days, and many days were surf days when there was no communication with the shore.

"In conclusion, I cannot speak in too high terms of the American Guano Company's *employés* there—the superintendent and mooring master; they do everything in their power to facilitate the speedy and safe loading of the ships; and a ship master will find it much to his advantage to fall in with their views regarding the loading and stowage of the vessel. They are most anxious to redeem the place from the bad repute into which it has fallen."

**JARVIS** island was discovered by Capt. BROWN, of the *Eliza Frances*, in 1821. According to Mr. J. D. HAGUE it is nearly 2 miles long by 1 mile wide, trending east and west, and containing about 1000 acres. Like Baker and Howland islands, it has the general features of a coral island, but it differs from them essentially in the fact that it once contained a lagoon which has gradually been filled up with sand and detritus, while the whole island has undergone some elevation. It therefore presents a basin-like form, the surface being depressed from the outer edge towards the centre. It is encircled by a fringing reef, or shore platform, about 300 feet wide; from this a gradually sloping beach recedes, the crown of which is from 18 to 28 feet high, forming a ridge or border of varying width, which surrounds the

island like a wall, from the inshore edge of which the surface of the island is gently depressed. Within this depression there are other ridges parallel to the outer one, and old beach lines and water marks,—the remaining traces of the waters of the lagoon, marking its gradual decrease and final disappearance. This flat depressed surface in the centre of the island is about 7 or 8 feet above the level of the sea. It bears but little vegetation, consisting of long, coarse grass, *mesembryanthemum*, and *portulacca*, and that is near the outer edges of the island where the surface is formed of coral sand mixed with more or less guano. In the central and lower parts the surface is composed of the sulphate of lime, and it is on this foundation that the principal deposit of guano rests. This feature of Jarvis island is an important one to consider in studying the difference between the guano found on it and that on Baker island, for it readily explains the presence, in much of the Jarvis guano, of the great excess of sulphate of lime, remarked by all who have investigated it, while the unequal mechanical mixture of the guano with the underlying sulphate accounts for the lack of uniformity in different samples. In examining the foundation of the guano deposit on Baker or Howland islands, by sinking a shaft vertically, the hard conglomerate reef rock is found directly underlying the guano. Resting on this foundation the guano has undergone only such changes as the climate has produced.

On Jarvis island, however, after sinking through the guano, one first meets with a stratum of sulphate of lime (sometimes compact and crystalline, sometimes soft and amorphous) frequently two feet thick, beneath which are successive strata of coral sand and shells deposited one above the other in the gradual process by which the lagoon was filled up.

Of the origin of this sulphate of lime there can hardly be any doubt. As the lagoon was nearly filled up, while (by the gradual elevation of the island) the communication between the outer ocean and the inner lake was constantly becoming less easy, large quantities of sea water must have been evaporated in the basin. By this means deposits would be formed containing common salt, gypsum, and other salts found in the waters of the ocean. From these the more soluble parts would gradually be washed out again by the occasional rains, leaving the less soluble sulphate of lime as we find it here. Some additional light is thrown on this matter by the different parts of the surface, which, though nearly flat, shows some slight variety of level. The higher parts, particularly around the outer edges, are composed chiefly of coral sand, either mixed with or underlying guano. Nearer the centre is a large tract, rather more depressed, forming a shallow basin in which the bulk of the sea water must have been evaporated, and whose surface (now partly covered with guano) is a bed of sulphate of lime, while, further, there is a still lower point, the least elevated of the whole, where the lagoon waters were, without doubt, most recently concentrated. This latter locality is a crescent shaped bed, about 600 feet long by 200 or 300 feet wide, having a surface very slightly depressed from the outer edge towards the middle. Around the borders are incrustations of crystallized gypsum and common salt, ripple marks and similar evidences of the gradually disappearing lake. The whole is composed of a crystalline deposit of sulphate of lime, which, around the borders, as already observed, is mixed with some common salt, while near the centre, where rain water sometimes collects after a heavy shower, the

salt is almost entirely washed out, leaving the gypsum by itself. It is closely, but not hard, packed, and is still very wet. (HAGUE.)

Ships moor here, as at Baker island, to mooring buoys in very deep water.

Capt. WILKES in his "Narrative of the United States Exploring Expedition, 1838-1842," speaking of Jarvis island, which was visited in December, 1840, by the surveying vessels *Peacock* and *Flying Fish*, says, "It is a small coral island, triangular in shape,  $1\frac{1}{2}$  miles in length east and west, and 1 mile wide north and south; it exhibits the appearance of a white sand beach, 10 or 12 feet above the sea, without a tree or shrub, and but a few patches of grass. The sea breaks violently around its shores, but no reef extends to any distance from the island, which may be closely approached. A few sea birds were seen about the island. No landing could be attempted, the surf being too heavy."

*Position*.—Jarvis island, which has also been reported as Bunker island, has been assigned the following positions:—lat.  $0^{\circ} 23'$  S., long.  $159^{\circ} 46'$  W.;—lat.  $0^{\circ} 22' 33''$  S., long.  $159^{\circ} 54' 11''$  W. (WILKES);—lat.  $0^{\circ} 21'$  S., long.  $159^{\circ} 52'$  W.;—lat.  $0^{\circ} 22'$  S., long.  $159^{\circ} 58'$  W. (HAGUE); *probable position*, lat.  $0^{\circ} 22\frac{1}{4}'$  S., long.  $159^{\circ} 54'$  W.; American authorities place it  $1\frac{1}{2}'$  more to the east.

*Directions* (from Honolulu to Jarvis island) by W. C. STONE, commanding the brig *Josephine*:—"On leaving Diamond head a south course to lat.  $19^{\circ}$  N. is about the best to adopt; but if headed off to S.S.W., still keep on the port tack. On attaining lat  $19^{\circ}$ , or a little southerly, you will have the regular Trade from East or E.N.E.; keep on the wind, good full, until getting into long.  $156^{\circ}$ , or  $156^{\circ} 30'$  W.,—this is plenty far enough to the eastward: then making a south course, you are in a position to run free with strong breezes, or to be headed off when first taking the S.E. Trades, without any anxiety. Always pass to the leeward of Christmas island, and do not tack, even if headed off S.W., for that will not last more than an hour or so, and you are sure to make a south (and most likely a little easterly) course before reaching the Line, if you wish. After passing Christmas island I always steer so as to be about 30 miles to windward of Jarvis when in that parallel of latitude.

"The currents have a westerly set of about 12 miles a day when in the N.E. Trades; but in about lat.  $6^{\circ}$  or  $8^{\circ}$  N. I have always found a strong easterly current, and have been set as much as 50 miles to the eastward, during a calm of twenty-four hours.

"The *doldrums* vary much, both in latitude and extent. I have carried a stiff breeze and fine weather until taking the S.E. Trades steady: and again, I have had a great quantity of rain, with most vexatious calms and baffling winds, for two or three days. We speak of the S.E. Trades, but I have seldom had them southward of E.S.E., and more generally from due East near the Equator.

"Approaching Christmas island there is always a strong westerly current, and if you shape a course to go about 30 miles to windward of the island you are sure to run on it at night; therefore steer for the west end of it, which lies in about lat.  $2^{\circ}$  N., long.  $157^{\circ} 30'$  W., and you will go all clear,—I have usually shaped my course this way and have not seen the island at all. Should you pass 30 miles to leeward of Christmas island, you can certainly weather Jarvis island. When in the latitude of Jarvis island, the current is uncertain and variable. I have known it

to set as strong to the eastward as ever I did to the westward; but this is not common.

"I have always found that in making these passages, both up and down, if the wind headed me off, I am always sure that it will be favourable in a proportionate manner in some other place. Consequently, a fair sailing ship may run free a great deal without fear of getting to leeward.

"There are no other islands on this track besides Christmas island. Tide-rips have sometimes a considerable resemblance to shoals."

### ISLANDS, ROCKS, AND SHOALS ALONG THE WEST COASTS OF CENTRAL AMERICA AND CALIFORNIA.

**Rivadentyra shoal**, discovered by M. RIVADENTYRA, in October, 1842. Soundings were made from a boat in 10, 14, 16, 27, and 56 feet,—then no bottom: lat.  $4^{\circ} 15' N.$ , long.  $85^{\circ} 10' W.$  *Position* very uncertain. Capt. T. HARVEY, of H.M.S. *Havana*, in July, 1857, passed 4 miles southward of the position given, and saw nothing.

**MALPELO island**.—The actual geographical position of this island has not been ascertained, but approximately it is lat.  $4^{\circ} 0' N.$ , and long.  $81^{\circ} 32' W.$  It is a high, barren, and perpendicular rock, visible about 16 or 17 leagues. A small quantity of green moss, and a few dwarf bushes grow in its cracks or gullies, and are the only signs of vegetation it possesses. It is surrounded with islets, and the whole may extend about 9 or 10 miles in a north and south direction. The centre of the island bears a resemblance from several points of view to the crown of the head; and its being barren accounts naturally enough for the name *Malpelo*, which the Spaniards have bestowed on it, which signifies *bald head*.

In the vicinity of this island the currents are strong, and have much the appearance of breakers; the set appears probably to be to the N.E. by E., at the rate of  $2\frac{1}{2}$  miles an hour.

**COCOS island**.—This island is about 4 miles in extent, and its northern part, Chatham bay, lies in lat.  $5^{\circ} 32' 57'' N.$ , long.  $86^{\circ} 58' 22'' W.$ , according to the determination of Sir EDWARD BELCHER in 1838. It is of considerable height, particularly the western part, and when viewed from a distance of 18 or 20 miles, on a bearing of N.  $73^{\circ} E.$  to N.  $81^{\circ} E.$ , its south-west extremity appears to rise abruptly from the sea, in steep rugged cliffs, to a considerable height, and then in a more moderate ascent to its most elevated part, which is a hill of no great size, whence it descends more uniformly to its northern extremity, which appears like a detached islet. When viewed from the northward, opposite the bays, the shores appear to be composed of broken, perpendicular, rocky precipices, beyond which the surface rises unevenly to the summit of the island, the whole covered with a thicket of small trees near the shore,—but on the more elevated land in the interior, with large spreading trees. This island can be seen more than 20 leagues off: but of its interior little is

known, except that it is rocky and mountainous, and probably contains a large lake or sheet of water, such having been seen by some of the party under Sir E. BELCHER. Its shores have only partially been examined, and principally at the northern part of the island, where there are two bays containing moderately good anchorage. Off the coasts are several detached islets and rocks, which extend some distance, and particularly from the S.W. part of the island, where they run off fully 2 miles, and would be dangerous if it were not that they are sufficiently high to be seen and avoided. The lower parts of these detached islets consist of a belt of white barren rock to the water's edge, and their tops are generally covered with trees. The coasts of the island are generally steep perpendicular cliffs, against which the sea breaks with so much violence as to preclude an attempt to land in any part except in the bays on its northern side. In many parts of these cliffs are falls of excellent water, a supply of which, it is said, can easily be procured, as well as cocoa nuts, and plenty of wood for fuel.\*

COLNETT, who visited the island in 1793, says:—"The western side of the island is the highest, and presents itself in the form of a round hill. The eastern side appears to be much broken, the land sloping in most parts abruptly to the sea, but in others presenting bold and perpendicular cliffs. The island does not appear to possess a spot where trees can grow that is not covered with them or some kind of bushy plant, which, when blended with the barrenness of intervening rocks, produces a picturesque effect; while the streams pouring down from their various fountains to the sea greatly heighten the beauty of the scene. It is Tahiti on a small scale, but without the advantage of its climate, or the hospitality of its inhabitants."

VANCOUVER appears not to have had so favourable an impression of the island, as COLNETT. "This island cannot be considered as having a pleasant appearance in any one point of view, for although its inland surface is much diversified by hills and valleys, yet the only low land of any extent that we were certain it possesses is in the bottoms of the two bays, each of which forms the extremity of one of these valleys, bounded by craggy precipices, from the foot of which extends a narrow strip of low flat land that terminates in a beach at the water side, resembling more the dreary prospect exhibited at the heads of the several branches of the sea we had so recently explored on the coast of North West America, than anything else I could compare them to.

"Every other part of the shore seemed to be composed of steep, broken precipices of rock, of which substance the interior of the island was apparently composed, as the naked cliffs were frequently seen protruding their barren sides through the thicket, which otherwise covered the surface of the island. This thicket, so far as we were able to ascertain, was chiefly composed of a great variety of trees of a moderate size, with an impenetrable underwood of the vine or supplejack kind, which opposed any excursion into the country; some attempts were, I believe, made to penetrate there by the watercourse, but this, from rocky precipices and other obstructions, was found to be equally impracticable; our knowledge of its productions must conse-

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\* This is according to VANCOUVER; but it has since been stated that all the trees have been cut down.

quently be confined to our observations on the small margin between the woods and the sea shore, the only part that was accessible to us."

The primary advantage of Cocos island is the abundant supply of water which it affords. This abounds in every part, and is to be easily procured at the stations to which vessels can resort. From its purity and limpid appearance, and from its being destitute of any colour or unpleasant taste, either from dead leaves or other decayed matter, VANCOUVER was led to infer, although heavy rains had fallen during his stay in January, 1795, that the larger streams of water had a more remote and permanent source than accidental showers. The soil in the immediate vicinity of the streams falling into the bays is of a poor, loose, sandy nature; but at a little distance behind the beach, and in the fissures of the rocks, there is a rich black mould, apparently of great fertility, and this is probably the case in other parts of the island. All the vegetable productions of the island grow luxuriantly. On the rocky cliffs near the sea, where the uneven surface will permit anything to grow, there is a coarse kind of grass which affords an excellent retreat for the sea-fowl, and also a particular kind of tree, something like the cloth plant of the South Sea islands, but much larger. Some of these trees grow to the height of 30 feet, and have a brightish coloured bark, free from branches to the top, where the leaves fall over, giving the trees the appearance of umbrellas. Besides these trees there are others in the interior, occasionally of a considerable size.

**Chatham bay.**—The north-easternmost anchorage of the island is named Chatham bay, from the armed tender accompanying VANCOUVER. It is not very large, and off its east and west points are two islets, the western and larger named Nuez, and the eastern Conic: these afford protection from the sea, especially the western islet. The width of the bay from point to point of the islets is about a mile, in a direction of S. 52° E., and N. 52° W.; and from this line of direction its extent to the bottom of the bay is also about a mile. The soundings are regular, of from 12 to 50 fathoms, and vessels may ride very snugly within less than  $\frac{1}{2}$  a mile of the beach, in about 20 fathoms water, but in a less depth the bottom does not appear to be so free from rocks. Here VANCOUVER anchored, in January 1794, in 33 fathoms, on a sandy and gravelly bottom, apparently good holding ground and free from rocks. The east point of the bay, which is a small conical islet lying close to the north-east extremity of the island, bore S. 51° E.,  $\frac{1}{2}$  a mile; the west point of the bay S. 75° W.; a steep rocky islet lying off it, from S. 87° W. to N. 66° W.; and the watering place at the mouth of a very fine stream, emptying itself over a sandy beach S. 13° W. about  $\frac{1}{2}$  of a mile. Within this the *Chatham* also anchored, in 26 fathoms, similar bottom.

Sir EDWARD BELCHER says, that in Chatham bay a vessel may anchor in 6 fathoms, within a  $\frac{1}{4}$  of a mile of the beach, but the best anchorage is in 12 fathoms. There a constant draught will be experienced between the openings of the islets, and a vessel can generally enjoy the refreshing sea-breezes, and fetch out at once, clear of the dangers, which are but few.

From the depth of 20 fathoms, the soundings outside of Chatham bay soon deepen to 40 and 50 fathoms, the latter at only  $1\frac{1}{2}$  miles from the shore. Both this and Wafer bay afford good protection from the winds prevailing during the early months

of the year; and from the abundance of the vegetation growing close to high water mark, it would seem that neither of them are subject to violent storms, or heavy seas.

**Wafer bay.**—At about a mile westward of Chatham bay is Wafer bay, which is more extensive and exposed than it, and its soundings are neither so regular, nor is the bottom so good. Into this bay a large stream of fresh water flows, and the sea breaks heavily. COLNETT appears to have preferred this bay to Chatham bay; he says:—"It may be easily known by a small rugged barren rock, about the size of a large boat, bearing West of the body of the bay about 5 or 6 miles. It lies east and west, and its greatest depth is not 2 miles, nor is it a mile in breadth; but I would not venture into it in a vessel of more than 200 tons. Its anchorage is in from 7 to 50 fathoms, and is nearly sheltered from all winds. This bay is also preferable to that at the north point, because the shore of the first is steep, while that of the latter consists of a beautiful valley and sandy beach, where cocoa-trees appear in greater numbers than I have seen in any other place. There is also a rivulet of water 18 or 20 feet in breadth, which is supplied from a basin a mile inland, in which our crew, to avoid the sharks, went and bathed. Although this bay is so small, it is very convenient, and as secure as the anchoring places generally are which are not entirely sheltered. Its principal inconvenience arises from the constant rains, as out of the four days we were beating off it, it rained during three of them, and sometimes with heavy storms of lightning and thunder. Those on shore experienced an equal amount of wet weather; and so thick was the rain, that for eight hours together we were not able to see twice the length of the ship; but this may not be the case at all seasons."

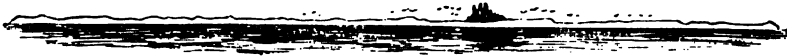
Of Wafer bay it may be said that one of its principal inconveniences is the heavy rollers, particularly at low water, at which time the flat extends out a considerable distance. It is also more subject to calms than Chatham bay, and consequently not so easy of ingress and egress; and being exposed to westerly winds, watering at all times is difficult, and at low tide quite impracticable.

The climate at Cocos island was considered by VANCOUVER to be temperate and salubrious. The thermometer, in January 1795, was usually between 78° and 80°, yet the heat was not so oppressive as was experienced further to the northward, and no inconvenience was experienced from the heavy rains.

The rise and fall of the tides by the shore are very considerable and regular, twice in the 24 hours, without any apparent stream, and are not influenced by currents. The night tides appear to be the highest, and probably rise 10 feet perpendicularly; but at the time of the observations, the surf was too high to permit a very correct measurement. The time of high water is about 2h. 10m. after the moon passes the meridian.

Cocos island appears to be well provided with sea-fowls: pigs, also, were left there by COLNETT, which appear to have increased and multiplied considerably. Fish are abundant, but difficult to catch; eels are large and numerous, as also are the turtles, but they appear shy of coming to the land. It is said that there are a large number of rats of the white and brown kinds on the island, also land crabs of a prodigious size, and that goats are in the interior, but keep to the heights.

**CLIPPERTON island and rock.**—The rock is in lat.  $10^{\circ} 17' N.$ , long.  $109^{\circ} 10' W.$ ; it is sufficiently lofty to be seen from a distance of 12 or 15 miles. When first in sight it appears not unlike a sail, but on a nearer approach it presents the appearance of an immense castle. The colour is very dark, in fact nearly black. This most dangerous island (and rock) is but little known, and thought by many not to exist. Its vicinity is generally indicated by the presence of numerous sea-birds—the white gannet, wide-awake, and booby, which are often found as much as 50 or 60 miles from the rock.



*Clipperton island and rock.*

The above position of Clipperton rock is from the determination of Sir EDWARD BELCHER, who visited it in May, 1839, and after mentioning that for a distance of about 15 miles, it presented the appearance of a brig close hauled, owing to the sun's rays playing on its nearest face, he proceeds to say: "the name, Clipperton rock, certainly misled us, and had we made the point at night, with a fair wind, would, almost *inevitably*, have severely damaged or destroyed both vessels. I certainly should have steered to pass it to the northward; merely assuming it to be a solitary rock.

"Nothing in this name would lead a seaman to imagine a high rock, placed on the southern edge of a coral lagoon island, 3 miles long north and south, by the same east and west.

"Its description should stand thus:—A very dangerous low lagoon island, destitute of trees, with a high rock on its southern edge, which may be mistaken for a sail.

"This rock can be seen 15 miles. In thick weather the low coral belt, which appears like sand, will not be distinguished until close to it. The breakers on the eastern side of it do not afford sufficient warning for a vessel to trim or change course. On the northern part of the belt, the land is a little raised, and appears to be clad with something like grass.

"There are two entrances, which at high water may be safe; but at the moment we passed, the surf was too heavy, and the reflux showed the rocks bare. The dangers from the rock, northerly, extend 2 miles easterly, and the same north-westerly. On the beach several large trees were observed, and an object which was thought to be part of a vessel, near the western opening.

"In the centre of the lagoon, as viewed from the mast-head, there is one large hole of blue water, and a second belt is connected with rock, attaching it to the eastern side of the island. This literally constitutes two islands, formed by its two openings; both are on the *weather* side of the island.

"No living trees were seen, but the whole island was covered with gannet, boobies, frigate, pelicans, and several kinds of tern, which had also been noticed in great numbers during the previous week, at least 500 miles to the eastward. From this,

an easterly current may be inferred, as these birds generally keep in its stream or tail course.\*

"No bottom was obtained by the *Sulphur*, with 100 fathoms of line, but the *Starling* had soundings with less than 100, on the northern side of the island.

"Sharks, porpoises, and turtle, were observed together. The former annoyed us much by biting at our patent logs, for which one was taken, and made an example of. They were very large, and literally swarmed. In all probability, they were attracted by a shoal of file (balistes) and other small fish which had been feeding off our copper since quitting the island of Cocos."

Capt. T. HAREVEY, of H.M.S. *Havana*, made Clipperton island, August, 1857, bearing W. by N.  $\frac{1}{2}$  N. "Hauled up to pass south of it, and stood along the island, trying for soundings, but found no bottom at 150 and 180 fathoms, 2 miles distant. It was covered with myriads of birds, abundance of large drift wood, and pieces of wreck. Plenty of porpoises about the ship. On the north side the sea was much less, and landing apparently easy in whale boats. Our standard chronometer gave the longitude within 2' of Sir EDWARD BELCHER's determination. It is correctly stated as being visible between 4 and 5 leagues off, but it is a formidable danger, and a wide berth should always be given to it at night."

Another determination in 1851 placed it in lat.  $10^{\circ} 13\frac{1}{2}'$  N., long.  $109^{\circ} 7\frac{1}{2}'$  W., while others (whalers) differ from BELCHER 8' to 10' both in lat. and long., but are less reliable. All agree in describing it "as most dangerous."

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**Passion rock** is said to have been discovered on a Good Friday of last century, by Capt. DUBOCAGE of *La Découverte*, but the position was not stated with accuracy. ESPINOSA placed it in lat.  $16^{\circ} 54'$  N., long.  $109^{\circ}$  W.; but Lieut.-Com. S. O. WOOLBRIDGE, of H.M.S. *Spy*, who is supposed to have seen it in December, 1847, says: "At 5h. 30m. P.M. we observed an island bearing W.N.W., which, though (as laid down on the chart) would have been 60 miles distant, we could only believe to be Passion rock. As we passed less than 30 miles to the westward of it in July last, and did not see it; and now passed 60 miles to the eastward of it, it is possible it may be laid down 30 miles too far to the westward. Lat.  $17^{\circ} 11'$  N., long.  $106^{\circ} 21'$  W., from bearings and supposed distance. It appeared high, and peaked in several places." Some however doubt its existence.

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**REVILLAGIGEDO islands.**—This is a group of several islands in lat.  $18^{\circ} 43'$  N., the largest of which, Socorro, is stated to be nearly 30 miles in extent. They are evidently of volcanic origin, and are said to supply neither wood nor water. The name Revella Ggeda, or Revillagigedo as the islands are more generally called, was given by COLNETT in 1793, in compliment to the Viceroy of Mexico, from whom he had received much kindness and civility.

**Socorro island** is lofty, making in several peaks, the highest of which is

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\* It does not therefore follow, as a matter of course, as noticed by some writers, that the appearance of birds denotes land to windward; they are more likely guided by tide.

probably 2000 feet above the level of the sea. Its northern and western shores have, as yet, only partially been examined, the principal anchoring places being on the south-eastern coast, which is represented to have a dreary and forbidding aspect. The general direction of the island is W.N.W. and E.S.E., and its average breadth is about 3 leagues. It may be said to consist of one mountain, which can be seen at the distance of about 20 leagues in clear weather, falling in a gradual descent on the south side. It is in a great measure covered with brushwood, intermixed with the low prickly-pear trees, and occasionally shaded with other trees of a larger growth. Some few patches of the soil are black and barren, as if fire had lately issued near it; and the top of the high land has the appearance, from a distance, of being an extinct volcano; the surface is of a whitish colour, like that of pumice-stone. Although Socorro has not recently given evidence of volcanic action, there is little doubt that the whole of this group of islets originated from that source.

Off the north and west coast of Socorro there are some detached rocks; and some rocks extend also off the south shore, which is a high bold coast. On this side of the island are *two bays*, **Cornwallis\*** and **Braithwaite**, in which there is moderately good anchorage, under shelter of the land. COLNETT says:—"The seasons of the year being considered, I think the safest anchorage, from June to December, is between the south-west points, opposite to two white coral beaches, which are the first two in succession from the south point of the island towards the west. It is the place where we first anchored, and remarkable from the pinnacle rocks which lay close off the west point of the bay. I prefer this place in the bad season, as the wind seldom blows more than two points to the southward of East. In the good season, however, that is from the latter end of December to the beginning of June, I prefer the south-east bay, being better anchorage and nearer to the cove, which was the only good landing-place we discovered, and is easily known, being a stony beach at the first inlet in the shore to the eastward of the south point;—all other parts of the coast on the south side of the island are iron-bound, which makes it extremely difficult, if not impossible, to land, except in very fine weather."

**Braithwaite bay** is an open roadstead, exposed to the eastward and southward; in it the soundings are 17 to 10 fathoms, sand and coral. Its position is lat.  $18^{\circ} 43' 14''$  N., and long.  $110^{\circ} 54' 15''$  W., according to Sir EDWARD BELCHER, who observes:—"The landing is rocky, with shores of lava *coulé*, and nothing like a beach. Neither wood nor water was visible, although from the constant clouds which hang over the high peaks, there must be a supply in some other point. Lieut. WOOD was despatched to examine the westward bay for wood or water. His report (not having landed) was, 'that goats were observed, the bay spacious, but no indications of wood or water visible.' It is probable that the goats find water.

"I found it difficult to penetrate into the interior of the island, even for a few hundred feet, owing to the prevalence of the *cactus opuntia*; all who attempted

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\* In this bay there are soundings of 30 to 20 fathoms, sandy bottom. COLNETT anchored here in 1793, in 25 fathoms, at about 2 miles from the shore, with the extremes of the island bearing from W.N.W. to E.S.E.; and two small sandy beaches N. by E. to N.N.E.

to do so suffered for their curiosity. One of my boat's crew made himself ill by eating a large bean which grew abundantly; but as I partook of them cooked without injury, I suspect him to have indulged too freely." Some of CORNETT's people also suffered severely from the same cause.

**San Benedicto island.**—This island, to the north-eastward of Socorro, is in lat.  $19^{\circ} 20' N.$ , long.  $110^{\circ} 45' W.$ , and when viewed from southward, has a barren appearance, with little or no vegetation. It is about 6 miles long, in a N.E. and S.E. direction, and 2 or 3 in breadth, and has a few rocks, just above the water, off several parts of it. Its surface is uneven, and its aspect is described as romantic, it having the appearance of two distinct islets, when seen from a distance of 9 or 10 miles. On its western side is a small bay, which has not been examined.

**Roca Partida** is a dangerous barren rock, 50 or 60 fathoms long, in a N.N.W. and S.S.E. direction, lying in lat.  $19^{\circ} 9' N.$ , long.  $112^{\circ} 2' W.$  Its breadth is only 25 or 30 fathoms, and both ends are 100 or 120 feet in height, the north-west end appearing forked, and the south-east end like a ragged haystack. The two heights are separated by a ragged saddle, which rises 18 or 20 feet above the surface of the sea, and is nearly perpendicular. At a boat's length from the rock there are 35 fathoms; and at  $\frac{1}{2}$  a mile off, 50 fathoms; and afterwards no bottom with 100 fathoms of line. The rock appears from every direction like a sail under a jury-mast.

**Clarion island.**—Westward of Socorro and Roca Partida is Clarion island, which is small, of considerable height, and very similar in its natural features to Socorro island. The hills are lofty, the highest peak being estimated to be 1500 feet high, and when bearing to the N.E. they make in three hummocks, which give the island, from a distance, the appearance of three distinct islets. It is probable that it contains but little fresh water, although there must be a great deal precipitated from the clouds, which almost constantly hang over the high land. Neither wood nor other necessaries can be obtained, still a vessel in great distress might have her wants to some extent relieved.

The island is about  $5\frac{1}{2}$  miles long, and 2 miles broad, and has been but little examined, particularly the north shore. On its southern side is a small bay named **Sulphur**, the east side of which is in lat.  $18^{\circ} 20' 36'' N.$ , long.  $114^{\circ} 40' 19'' W.$ ; in this Sir EDWARD BELCHER attempted to moor, but was prevented by the breaking of his anchor. The east end of the island appears to be steep and precipitous.

*Islands near the Revillagigedo group.*—Many islands have been reported by whalers in the vicinity of  $19^{\circ} N.$  and  $114\frac{1}{2}^{\circ} W.$ , but their existence is *very doubtful*: as *Cloud island*, in lat.  $19^{\circ} 46' N.$ , long.  $115^{\circ} W.$ ; *Freshwater island*, in lat.  $19^{\circ} 20' N.$ , long.  $115^{\circ} 10' W.$ ; *Santa Rosa*, in lat.  $18^{\circ} 40' N.$ , long.  $114^{\circ} W.$ ; *Shaler island*, in lat.  $18^{\circ} 26' N.$ , long.  $115^{\circ} 30' W.$ ; *Nublada*, in lat.  $18^{\circ} 15' N.$ , long.  $114^{\circ} W.$ ; and *Best island*, in lat.  $18^{\circ} 5' N.$ , long.  $114^{\circ} 16' W.$  The positions assigned to Santa Rosa, Nublada, and Freshwater islands were examined by Lieut. CATESBY,

U.S.N., and no indication of land was seen, but Clarion island was in sight at the time, hence probably all of them are erroneous positions of the latter (*see* p. 292). *New Ballista island* in lat.  $18^{\circ} 14' N.$ , long.  $113^{\circ} 14' W.$ , also in lat.  $18^{\circ} 6' N.$ , long.  $113^{\circ} 48' W.$ ; and an *island* in lat.  $18^{\circ} 11' N.$ , long.  $114^{\circ} 48' W.$ , are also whalers' reports, in the vicinity of the Revillagigedo group, and are *very doubtful*.

Sir EDWARD BELCHER also sought for some of these for a considerable time, without success. It may, therefore, be concluded that as the position of Clarion was not till lately accurately ascertained, it has been seen by various parties, and reported by each as a distinct discovery.

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**Diamant bank.**—In October, 1862, a *bank-sand* awash was reported in lat.  $21^{\circ} N.$ , long.  $113^{\circ} 50' W.$

*Shovel island*, in lat.  $22^{\circ} N.$ , long.  $112^{\circ} 15' W.$ ; and *Shaler island*, in lat.  $21^{\circ} 55' N.$ , long.  $113^{\circ} 5' W.$ , whalers' reports, are otherwise unknown.

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**ALIJOS rocks.**—This is a very dangerous group of rocks, lying off the coast of California, in lat.  $24^{\circ} 57' 25'' N.$ , long.  $115^{\circ} 45' 20'' W.$  The southernmost and largest rock is about 110 feet high, and there are many above and under water close to it.

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**GUADALOUPE island** is northward of the Alijos rocks, and its north point is represented to be in lat.  $29^{\circ} 10' 50'' N.$ , long.  $118^{\circ} 18' 30'' W.$  It is about 15 miles long by 5 miles broad, and is very lofty in the interior, a chain of hills extending through the whole length of the island. The highest of these hills is over 2000 feet high, and one near the north point of the island is estimated to be even 3412 feet in elevation. The island can be seen a distance of about 60 miles, and will appear, when bearing either east or west, lower at its southern extremity than at its northern.

Off the south end of the island are two rocky islets at some distance from the shore, the outermost of which is 500 feet high. The shores are in general bold, but have not been closely examined; although it is said that a small cove exists on the south-east shore, which is formed by some rocky islets, and contains the only anchorage in the island, the riding being in 7 fathoms, and the shelter from all winds except those between S.E. and E.N.E.

But few supplies of any description can be obtained here, the island being quite barren and rocky, and affording very little sustenance for anything except goats. It is said that wood and water may be obtained from a cove on the north-east side of the island.

VANCOUVER says that the Spaniards were accustomed to make this island when bound southward from Monterey, or from their other northern settlements; in which route they passed westward and out of sight of the California islands, for the advantage of continuing in the strength of the N.W. winds; they thus reached this island, and afterwards steered a course for cape San Lucas.

**CORTES bank**, S.W. of San Clemente island, near the Californian coast, extends 16 miles W. by N. and E. by S., with an average breadth of  $3\frac{1}{2}$  miles. The shoalest spot,  $2\frac{1}{2}$  fathoms, is 5 miles from the S.E. tail of the bank, in lat.  $32^{\circ} 25\frac{1}{2}'$  N., long.  $119^{\circ} 5'$  W. For further details see "Sailing Directions for the West Coast of North America," by J. F. Imray, p. 145.

*Swift island*, a whaler's report, in lat.  $33^{\circ}$  N., long.  $119^{\circ} 6'$  W., certainly does not exist; it would be midway between San Clemente and San Nicolas. (See "Sailing Directions for the West Coast of North America," by J. F. Imray.)

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A *shoal*, lying S.W. 80 miles from the South Farallone, or in lat.  $36^{\circ} 45'$  N. long.  $124^{\circ}$  W., with 5 to 7 fathoms water on it, has been frequently reported. It has been searched for by the U.S. steamer *Mohongo*, by the U.S. Coast Survey schooner *Marcy*, and by the U.S. steamer *Lincoln*. These vessels have examined an area of between 2000 and 2500 square miles of the ocean about the locality assigned to the shoal, but no bottom was discovered with 100 fathoms of line. In consequence of the last reports in 1868-9, a further area of 750 square miles was examined, and neither bottom found nor discoloured water observed. The soundings were made every half hour with 100 fathoms of line, and in weather favourable for the work.

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#### SCATTERED ISLANDS, AND REPORTED ROCKS AND SHOALS IN THE EAST PART OF THE PACIFIC, BETWEEN LAT. $50^{\circ}$ N. AND THE EQUATOR, AND BETWEEN THE W. COAST OF N. AMERICA AND LONG. $180^{\circ}$ .

A *reef*, reported by Capt. PALMER of the *Kingfisher*, in lat.  $44^{\circ} 23'$  N., long.  $152^{\circ} 53'$  W., is otherwise unknown.

A *rock*, very dangerous, owing to the top being barely out of water, was reported in 1860 by Capt. DE CAMP, of U.S. steamer *Shubrick*. The water was seen to break over it. *Position*—10 miles nearly due West from the entrance to Crescent City harbour, or lat.  $41^{\circ} 44\frac{1}{2}'$  N., long.  $124^{\circ} 24\frac{1}{2}'$  W.

**Reed rocks.**—In 1850 Capt. REED, of the *Emma*, reported two shoals (rocks),—one 150 fathoms long by 66 fathoms broad,—the other 100 fathoms long by 38 fathoms broad,—with 3 and 5 fathoms water over them, respectively, and, in his opinion, causing breakers in heavy weather. The U.S. sloop-of-war *Falmouth* also saw them in 1851; the *position* given being lat.  $37^{\circ} 24'$  N., long.  $137^{\circ} 27'$  W., the same as that originally reported by Capt. REED. In 1856 Capt. REDFIELD, of the whaler *Susan Abigail*, saw some rocks with only 10 feet water over them, the largest 150 feet long by 50 feet broad; and saw, S.S.E. of these,  $\frac{1}{4}$  of a mile distant, discoloured water, indicating another and smaller patch; the *position* given being

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11 miles further north and 3' more westerly than that of the *Falmouth*, viz., lat.  $37^{\circ} 35' N.$ , long.  $137^{\circ} 30' W.$  All the reports probably refer to the same danger, if it exists, which some regard as very doubtful, having passed over the assigned locality. *Mean of positions*, lat.  $37^{\circ} 28' N.$ , long.  $137^{\circ} 28' W.$

**Rock**:—Capt. F. DE LEGARDE, of the French ship *Jean Pierre*, from San Francisco to Valparaiso, Sept. 1868, reported that when in lat.  $31^{\circ} 12\frac{1}{4}' N.$ , long.  $125^{\circ} W.$  ( $127^{\circ} 20' W.$  of Paris) he discovered a rock extending about 8 or 10 yards above the level of the sea making in three peaks.

*Group of islands*, in lat.  $31^{\circ} 6' N.$ , long.  $129^{\circ} 24' W.$ , a whaler's report, is improbable in the position given; supposing a misprint, W. for E., it would be the Udsi-sima off the coast of Japan.

*Island*, whaler's report, in lat.  $30^{\circ} N.$ , long.  $141^{\circ} 18' W.$ , is otherwise unknown.

*New island*, whaler's report, in lat.  $28^{\circ} 25' N.$ , long.  $133^{\circ} W.$ , is otherwise unknown.

**Maria Lazara**, variously placed in lat.  $27^{\circ} 20' N.$ , long.  $140^{\circ} 50' W.$ ,—in lat.  $27^{\circ} 40' N.$ , long.  $140^{\circ} 49' W.$ ,—and on Admiralty chart of Pacific in lat.  $27^{\circ} 45' N.$ , long.  $139^{\circ} 22' W.$ ,—represents, on old Spanish charts, the Donna Maria Lazara, in lat.  $28^{\circ} N.$ , long.  $144\frac{1}{2}^{\circ} W.$ , and Donna Maria Lagorta or Lazara in lat.  $27^{\circ} N.$ , long.  $156^{\circ} W.$ , and has been supposed to be the *shoal* on which the U.S. sloop-of-war *Levant* was lost in 1861. Spanish charts, however, show it as an *island*, and if Los Majos (see p. 2) represent the Hawaiian archipelago, then Donna Maria Lazara would be Midway or Ocean island (see pp. 61-66).

*Gaspar rock*, in lat.  $26^{\circ} 30' N.$ , long.  $131^{\circ} W.$ ; *Cooper* or *Copper island*, in lat.  $25^{\circ} 48' N.$ , long.  $131^{\circ} 26' W.$ ; and *island with breakers* in lat.  $25^{\circ} 30' N.$ , long.  $133^{\circ} W.$ ;—are whalers' reports, and nothing is known of them. WILKES (1841) sought for Cooper island but saw no appearance of land.

*Passion island*, a whaler's report, in lat.  $25^{\circ} 48' N.$ , long.  $136^{\circ} 36' W.$ , is otherwise unknown.

**Dragon island**, reported by Capt. ANDREW, of the bark *Dragon*, in lat.  $24^{\circ} 30' N.$ , long.  $131^{\circ} 20' W.$ , is stated to be low, but visible 10 miles: other reports corroborate its existence.

*Henderson island*, reported and placed on charts in lat.  $24^{\circ} 22' N.$ , long.  $128^{\circ} 36' W.$ , is an error;—for N. read S., where Henderson or Elizabeth island is well known. \*

*Island*, whaler's report, in lat.  $22^{\circ} 40' N.$ , long.  $131^{\circ} 25' W.$ , is otherwise unknown.

*Barney rock*, whaler's report, in lat.  $21^{\circ} N.$ , long.  $142^{\circ} W.$ , is otherwise unknown.

*Island*, whaler's report, in lat.  $21^{\circ} N.$ , long.  $149^{\circ} 30' W.$ , is improbable so near the Hawaiian islands.

*Copper island* in lat.  $20^{\circ} 26' N.$ , long.  $130^{\circ} 54' W.$ ; and *Cooper island* in lat.  $20^{\circ} 6' N.$ , long.  $131^{\circ} 54' W.$ ,—whaler's reports,—were not seen by WILKES. There seems to be some error about the reported position of this island (*see* p. 295).

*Bank*, in lat.  $20^{\circ} N.$ , long.  $167^{\circ} 40' W.$  (Admiralty chart, long.  $168^{\circ} 10' W.$ )—whaler's report—is otherwise unknown.

*Island*, whaler's report, in lat.  $20^{\circ} N.$ , long.  $179^{\circ} 48' W.$ , is otherwise unknown.

*Malrone* or *Maloon island*, old reports, in lat.  $19^{\circ} 23' N.$ , long.  $165^{\circ} 23' W.$ ,—and in lat.  $19^{\circ} 20' N.$ , long.  $165^{\circ} 25' W.$ , has no existence. The U.S. Exploring Expedition passed directly over the second position, and kept on the same parallel for 70 miles, in weather so clear as to render everything visible in a radius of 15 miles.

*Wilson island*, whaler's report, in lat.  $19^{\circ} 22' N.$ , long.  $166^{\circ} 50' W.$ , also in lat.  $19^{\circ} 17' N.$ , long.  $166^{\circ} 48' W.$ , has no existence (*see above*).

*Haystrous island*, in lat.  $19^{\circ} 6' N.$ , long.  $163^{\circ} 33' W.$ ; and an *island* in lat.  $19^{\circ} 6' N.$ , long.  $164^{\circ} 33' W.$ ; both whaler's reports, are otherwise unknown, and are very doubtful.

*Shoal*, whaler's report, in lat.  $18^{\circ} 26' N.$ , long.  $173^{\circ} 24' W.$ ; also a *shoal*, whaler's report, in lat.  $18^{\circ} 20'$  ( $? 18^{\circ} 28'$ )  $N.$ , long.  $170^{\circ} 30' W.$ ; have no existence. The U.S. Exploring Expedition examined the locality for 60 miles, east and west.

*New Baldago island*, a whaler's report, in lat.  $18^{\circ} 15' N.$ , long.  $143^{\circ} 48' W.$ , is otherwise unknown.

*Island*, in lat.  $17^{\circ} 35' N.$ , long.  $136^{\circ} W.$ ; and *New Island*, in lat.  $17^{\circ} N.$ , long.  $136^{\circ} W.$ ; both whaler's reports, are otherwise unknown. These and other islands, reported by whalers to exist between the parallels of  $18\frac{1}{2}^{\circ}$  and  $16^{\circ} N.$ , and between the meridians of  $133^{\circ}$  and  $136^{\circ} W.$ , under various names as *Boccaperde*, *Roca Coral*, &c., have been searched for by Sir EDWARD BELCHER of H.M.S. *Sulphur* and Capt. TROLLOPE of H.M.S. *Rattlesnake*, but could not be found, although many birds gave indication of land somewhere near. *Roca Coral* was variously placed in lat.  $17^{\circ} 5' N.$ , long.  $136^{\circ} W.$ ,—and in lat.  $16^{\circ} 18' N.$ , long.  $136^{\circ} 10' W.$

A *reef*, whaler's report, in lat.  $17^{\circ} 6' N.$ , long.  $156^{\circ} 14' W.$ , or 100 to 110 miles south of Hawaii, is not probable.

*Reefs*, whalers' reports, in lat.  $16^{\circ} 49' N.$ , long.  $160^{\circ} 40' W.$ , also in lat.  $16^{\circ} 38' N.$ , long.  $160^{\circ} 53' W.$ , are otherwise unknown.

An *island*, whaler's report, in lat.  $16^{\circ} 30' N.$ , long.  $163^{\circ} 24' W.$ , is otherwise unknown.

A *shoal*, whaler's report, in lat.  $16^{\circ} 30' N.$ , long.  $163^{\circ} 54' W.$ , is otherwise unknown.

*Jane island*, in lat.  $16^{\circ} 10' N.$ , long.  $173^{\circ} 15' W.$ , has no existence. The U.S. Exploring Expedition passed within 5 miles of the assigned position.

*Cornwallis island*, whaler's report, in lat.  $16^{\circ}$  N., long.  $171^{\circ} 36'$  W., has no existence in that position (*see* p. 268).

*Gaspar island*, whaler's report, in lat.  $15^{\circ}$  N., long.  $176^{\circ} 26'$  W., has no existence.

*Inhabited island*, whalers' reports, in lat.  $14^{\circ} 44'$  N., long.  $170^{\circ} 36'$  W., also a *shoal*, in lat.  $14^{\circ} 50'$  N., long.  $170^{\circ} 32'$  W., are otherwise unknown.

A *shoal*, whaler's report, in lat.  $13^{\circ} 40'$  N., long.  $121^{\circ} 10'$  W., is otherwise unknown.

A *shoal*, whaler's report, in lat.  $13^{\circ} 30'$  N., long.  $170^{\circ} 30'$  W., is otherwise unknown.

An *island*, whaler's report, lat.  $13^{\circ} 4'$  N., long.  $168^{\circ} 22'$  W., is otherwise unknown.

An *island*, whaler's report, in lat.  $13^{\circ}$  N., long.  $165^{\circ} 40'$  W., is otherwise unknown.

An *island*, whaler's report, in lat.  $11^{\circ} 30'$  N., long.  $163^{\circ} 58'$  W., has been sought for by the brig *Josephine* running on the parallel of  $11\frac{1}{2}^{\circ}$  N., between long.  $163^{\circ} 27'$  and  $164^{\circ} 25'$  W., on a bright clear day, with good look-out aloft, and without seeing anything.

*San Pedro island*, in lat.  $11^{\circ} 17'$  N., long.  $179^{\circ}$  W., was not found by the U.S. Exploring Expedition.

*Manuel Rodriguez reef*, placed on old Spanish charts in lat.  $11^{\circ} 20'$  N., and variously in long.  $154^{\circ} 20'$  W. or  $163^{\circ}$  W., and by *ESPINOSA* in long.  $141^{\circ} 17'$  W., is found on English charts in lat.  $11^{\circ}$  N., long.  $153^{\circ} 55'$  W., which locality was passed over by Lieut. RINGGOLD of U.S. Exploring Expedition (1840). Looking at its old position with regard to Los Majos (*see* p. 2), it is difficult to make any conjecture as to what known island or shoal it represents.

*Fanning island*, whaler's report, in lat.  $11^{\circ} 6'$  N., long.  $154^{\circ} 30'$  W., is otherwise unknown. There is a Fanning island much further south and west (*see* p. 271).

*Poltroon island*, in lat.  $10^{\circ} 25'$  N. long.  $164^{\circ} 38'$  W., also in lat.  $10^{\circ} 23'$  N., long.  $165^{\circ} 23'$  W., does not exist, according to Capt. STONE of the brig *Josephine*, who, in search of guano, was near the position two days, and sailed on the parallel of  $10^{\circ} 25'$  N., from long.  $163^{\circ} 55'$  to  $165^{\circ} 20'$  W., with a good look-out; nothing seen but a few birds.

*Wastock* or *Watson island*, whaler's report, in lat.  $10^{\circ} 9'$  N., long.  $152^{\circ} 19'$  W., is otherwise unknown. Probably the Vostok island in lat. S.

An *island*, whaler's report, in lat.  $10^{\circ} 6'$  N., long.  $173^{\circ} 12'$  W., is otherwise unknown.

An *island*, or a *reef* (as on some charts), lat.  $10^{\circ} 6'$  N., long.  $178^{\circ}$  W., also in long.  $179^{\circ} 25'$  W., whalers' reports, is otherwise unknown.

*Washington island*, a whaler's report, in lat.  $9^{\circ}$  N., long.  $126^{\circ}$  W., is improbable in that position.

*Barber* or *Barbary island*, reported in lat.  $8^{\circ} 55'$  N., long.  $178^{\circ}$  W., is otherwise unknown. Islands of this name have been frequently reported by whalers in different parts of the Pacific (*see* below and p. 299).

An *island*, whaler's report, in lat.  $8^{\circ} 40'$  N., long.  $168^{\circ}$  W., is otherwise unknown.

*Diana shoal* is said to have been discovered by Capt. FANNING, in 1798, who reported but 6 feet of water on it. It has been placed in lat.  $8^{\circ} 40'$  N., long.  $157^{\circ} 20'$  W.; but if it exists, the position given is inaccurate, the locality having been passed over by several ships, and by H.M.S. *Hecate* in 1863.

*Three islands*, whaler's report, in lat.  $8^{\circ} 11'$  N., long.  $114^{\circ} 48'$  W., are otherwise unknown and improbable.

*Barber island*, reported in the *China Mail* to be in lat.  $8^{\circ} 4'$  ( $? 8^{\circ} 20'$ ) N., long.  $170^{\circ}$  W., is otherwise unknown.

An *island*, whaler's report, in lat.  $8^{\circ}$  N., long.  $177^{\circ} 20'$  W., is otherwise unknown.

A *rock*, whaler's report, in lat.  $7^{\circ} 51'$  N., long.  $139^{\circ} 54'$  W., is otherwise unknown.

*Four rocks*, whaler's report, in lat.  $7^{\circ} 51'$  N., long.  $176^{\circ} 6'$  W., are otherwise unknown.

An *island*, whaler's report, in lat.  $7^{\circ} 48'$  N., long.  $173^{\circ} 12'$  W., is otherwise unknown.

An *island*, whaler's report, in lat.  $6^{\circ} 45'$  N., long.  $106^{\circ} 10'$  W.;—and *Duncan island*, whaler's report, in lat.  $6^{\circ}$  N., long.  $106^{\circ}$  W., are otherwise unknown.

*Davis island*, reported in the *New York Tribune* in lat.  $6^{\circ} 40'$  N., long.  $170^{\circ} 10'$  W., is otherwise unknown.

An *island*, in lat.  $6^{\circ} 39'$  N., long.  $166^{\circ} 18'$  W.;—an *island*, in lat.  $6^{\circ} 38'$  N., long.  $166^{\circ} 2'$  W.;—an *island* (?) or *shoal* (?) in lat.  $6^{\circ} 33'$  N., long.  $166^{\circ} 3'$  W.;—all whalers' reports, are otherwise unknown. The *Josephine*, in search of guano islands, ran over the second position at midday, and although many birds were seen—among them land birds—no land was visible.

A *shoal*, reported in the *China Mail*, in lat.  $6^{\circ} 36'$  N., long.  $160^{\circ}$  W., is otherwise unknown.

A *shoal*, whaler's report, in lat.  $6^{\circ} 30'$  N., long.  $163^{\circ} 30'$  W., is otherwise unknown. Probably the Kingman reef (*see* p. 299).

**Kingman** or **Thorndike reef**.—Capt. KINGMAN of the *Shooting Star*, reports,—"At 10 A.M. made breakers ahead; kept on our course until we were within a mile of them, then steered W.S.W., and ran on our course 10 miles: judging that we had passed all danger, hauled up to the south, and soon saw bottom; found 6 fathoms.

Kept off again and shortly deepened to 25 fathoms, no bottom. The shoal is of coral and sand; and when the breakers on the N.E. part bear East, with a moderate wind, a few small spots of sand or coral can be seen above water. The N. part runs E.S.E. and W.N.W., 12 miles; shoal water extends several miles to the southward." *Position* given, lat.  $6^{\circ} 27' N.$ , long.  $162^{\circ} 12' W.$

The master of the *Alice Thorndike* reported this shoal in 1859; he stated it to be very dangerous, and the west end in lat.  $6^{\circ} 24' N.$ , long.  $162^{\circ} 22' W.$

The same danger was reported by a whaler in lat.  $6^{\circ} 30' N.$ , long.  $162^{\circ} 32' W.$  Probable *position*, lat.  $6^{\circ} 27' N.$ , long.  $162^{\circ} 22' W.$

**Caldew reef**, reported in lat.  $6^{\circ} 24' N.$ , long.  $161^{\circ} 44' W.$ , may be identical with the foregoing, in which case the *mean position* from the four observations is, lat.  $6^{\circ} 26' N.$ , long.  $162^{\circ} 12' W.$ , or as originally given by Capt. KINGMAN. It seems certain there is a reef or two 40 or 45 miles N.E.-ward from Palmyra island.

*Knox islands*, two in number, a whaler's report, in lat.  $5^{\circ} 58' N.$ , long.  $172^{\circ} W.$ , are otherwise unknown.

**Maria shoal** was reported by Capt. CRANE of the schooner *Maria*, in 1862. The schooner ran over a reef of rocks, with discoloured water in the vicinity,—and about 4 fathoms over it—in lat.  $5^{\circ} 55' N.$ , long.  $164^{\circ} W.$

*Starbuck island* reported in lat.  $5^{\circ} 40' N.$ , long.  $156^{\circ} 55' W.$ , according to the *China Mail*, is an error: for N. read S.

*Madison island*, a whaler's report, in lat.  $5^{\circ} 30' N.$ , long.  $159^{\circ} W.$ , is otherwise unknown.

*Barber island*, a whaler's report, in lat.  $5^{\circ} N.$ , long.  $177^{\circ} 50' W.$ , is otherwise unknown (*see* p. 298).

*Prospect island*, a whaler's report, in lat.  $4^{\circ} 42' N.$ , long.  $161^{\circ} 33' W.$ , may be either Samarang or Washington island (*see* p. 270),—the position given being midway between the two.

*An island*, whaler's report, in lat.  $4^{\circ} 33' N.$ , long.  $159^{\circ} 45' W.$ , is probably Washington island (*see* p. 270).

*Four islands*, whaler's report, in lat.  $4^{\circ} 32' N.$ , long.  $169^{\circ} 32' W.$ ;—Capt. STONE, of the *Josephine*, sought for but could not find them, though birds were numerous in the vicinity.

*Washington island*, whaler's report, in lat.  $4^{\circ} 30' N.$ , long.  $128^{\circ} W.$ , is otherwise unknown.

*Sarah Anne island*, reported in lat.  $4^{\circ} N.$ , long.  $154^{\circ} 22' W.$ , and also in long.  $153^{\circ} 30' W.$ , is otherwise unknown; the first may be a misprint; read S. for N., and it is the position (nearly) of Malden island.

*Barbara island*, whaler's report, in lat.  $3^{\circ} 54' N.$ , long.  $173^{\circ} W.$ ,—also in lat.  $3^{\circ} 42' N.$ , long.  $173^{\circ} 6' W.$ , is otherwise unknown.

**Walker islands**, reported by Capt. WALKER in 1814, in lat.  $3^{\circ} 34' N.$ , long.  $149^{\circ} 15' W.$ , were stated to be small, low, and well wooded; nothing further is known of them.

A *shoal*, whaler's report, in lat.  $4^{\circ} N.$ , long.  $174^{\circ} 30' W.$ , is otherwise unknown.

*Week island*, in lat.  $3^{\circ} 47' N.$ , long.  $158^{\circ} 37' W.$ ;—*Washington Island*, in lat.  $3^{\circ} 42' N.$ , long.  $159^{\circ} 24' W.$ ;—and *America island*, in lat.  $3^{\circ} 40' N.$ , long.  $159^{\circ} 25' W.$ ;—all whalers' reports, may be other positions for Fanning island (*see* p. 271).

A *reef* (or *tide rips*), whaler's report, 80 miles eastward of Fanning island, or in lat.  $3^{\circ} 35' N.$ , long.  $158^{\circ} W.$ , is otherwise unknown.

*Makin island*, as reported in the *New York Tribune* in lat.  $3^{\circ} 2' N.$ , long.  $172^{\circ} 46' W.$ , is probably an error; for W. read E. and it is Makin island in the Gilbert archipelago.

*Matthew island*, as reported in the *New York Tribune* in lat.  $2^{\circ} 3' N.$ , long.  $173^{\circ} 28' W.$ , is probably an error; for W. read E. and it is Marakei or Matthew island in the Gilbert archipelago.

*Gallego island*, a whaler's report, in lat.  $1^{\circ} 48' N.$ , long.  $104^{\circ} 8' W.$ , is otherwise unknown.

*Faguin island*, a whaler's report, in lat.  $0^{\circ} 46' N.$ , long.  $171^{\circ} 59' W.$ , is probably a misprint for  $176^{\circ}$ ,—in which case it might be Howland island (*see* p. 278).

An *island*, whaler's report, in lat.  $0^{\circ} 41' N.$ , long.  $176^{\circ} 20' W.$ , is probably Howland island (*see* p. 278).

*Faguin island*, whaler's report, in lat.  $0^{\circ} 11' N.$ , long.  $171^{\circ} 55' W.$ , is probably a misprint for  $176^{\circ}$ ,—in which case it would be Baker island (*see* p. 279).

**Newmarket island**, laid down on the authority of the U.S. consul at Apaiang (Gilbert islands), in  $0^{\circ} 22' N.$ , long.  $174^{\circ} 40' W.$ , is otherwise unknown: may be either Howland or Baker island (*see* pp. 278–280).

A *reef*, laid down on the authority of the U.S. consul at Apaiang in lat.  $0^{\circ} 21' N.$ , long.  $179^{\circ} 20' W.$ , is otherwise unknown.

An *island*, whaler's report, in lat.  $0^{\circ} 17' N.$ , long.  $160^{\circ} 20' W.$  is otherwise unknown. Read S. for N. and the position is nearly that of Jarvis island (*see* p. 282).

*Howland island*, in old editions of Horsburgh, in lat.  $0^{\circ} 15' N.$ , long.  $177^{\circ} 18' W.$ , is probably Baker island (*see* p. 279).

A *reef*, whaler's report, on the Equator, in long.  $150^{\circ} W.$ , is otherwise unknown.

*Washington island*, a whaler's report, on the Equator, in long.  $159^{\circ} 39' W.$ , is otherwise unknown, but is probably Jarvis island in  $0^{\circ} 30' S.$  (*see* p. 283).

## APPENDIX I.

p. 15;—**Hilo bay**:—A lighthouse has been erected on Paukaa point, at the entrance to Hilo harbour, from which is exhibited—

A *Fixed White Light*, elevated 50 feet about the sea, and visible 10 miles.

From the lighthouse the outer point of the reef bears S.  $58^{\circ}$  E.;—inner point of the reef S.  $39^{\circ}$  E.;—Governor's flagstaff (about the centre of the harbour) S.  $22^{\circ}$  E.;—Lelewi point S.  $79^{\circ}$  E.;—and Makahanaloa point N.  $2^{\circ}$  W.

p. 20;—**Kawaihae**:—A *Fixed White Light* is exhibited as a guide to the anchorage of Kawaihae; elevation about 50 feet above the sea, and visible 10 miles.

From the N.E. corner of the reef the light bears N.E. by N.  $\frac{1}{2}$  N.: and with the light bearing E.N.E. there is good anchorage about a  $\frac{1}{4}$  of a mile from the shore. *Variation*  $9\frac{1}{4}^{\circ}$  E. in 1869.

p. 38;—**Honolulu harbour**:—A light is exhibited from a lighthouse erected on the inner edge of the western reef, bounding the entrance of the channel into Honolulu harbour, Oahu.

It is elevated 26 feet above the sea; visible from between the bearings East round by North to N.W. by W., and visible 9 miles.

From the lighthouse the Spar or Fairway buoy bears S. by W.  $6\frac{1}{2}$  cables, Diamond point S.E. by E., Barbers point W.  $\frac{1}{4}$  S., and the eastern corner of the Custom-house N. by E.  $\frac{1}{4}$  E.: near to this corner of the Custom-house, from a tower, a *green* light is exhibited, elevated 28 feet above the sea, and in clear weather should be seen from a distance of 5 miles.

*Directions*.—To enter the harbour by night, bring the two lights in a line, and keep them so until within a cable of the lighthouse on the reef, then steer to the eastward, to avoid the end of the spit on which the lighthouse is built, towards the east end of the new wharf, and when half way between the light on the reef and the new wharf steer N.W. to the anchorage inside. *Variation*  $9\frac{1}{4}^{\circ}$  E., in 1869.

p. 153;—**Bayonnaise island** and a *shoal near it*;—In 1863 (May) the *Elizabeth Kimball* passed within 2 miles of this island, and the master described it "as peaks of rocks from 20 to 40 feet high, in lat.  $31^{\circ} 52'$  N., long.  $139^{\circ} 53'$  E. The current was setting N.E. at the rate of 2 miles an hour, and as it was nearly calm the ship was with difficulty kept from drifting on them. I passed over a shoal, in about 5 fathoms water, seeing the bottom distinctly, 7 miles W.S.W. from the rocks. Strong rippings will be found on approaching the rocks from the S.W. within 8 or 10 miles of their position."

Thus, the *mean position* for Bayonnaise island becomes, lat.  $31^{\circ} 56\frac{1}{2}'$  N., long.  $139^{\circ} 59\frac{1}{2}'$  E., and the *shoal* is in about lat.  $31^{\circ} 53'$  N., long.  $139^{\circ} 50'$  E.

p. 171;—**Britomart reef**:—This reef, close to which the *Britomart* passed (1869), on a voyage from Australia to Hongkong, is level with the water, and from 400 to 500 feet long. It lies nearly 75 leagues to the westward of Asuncion (Mariana islands), and the position given is, lat.  $19^{\circ} 18' N.$ , long.  $141^{\circ} 34' E.$

The *Britomart* afterwards passed over the assigned position of Lindsay island (see p. 171), but it was not visible from the masthead, in fine clear daylight.

p. 172;—**Aligator shoal**:—The master of the *Aligator*, from Sydney to Hong Kong, Jan. 9th, 1844, reported a "shoal in the form of a horse-shoe, extending 10 miles at least : position lat.  $15^{\circ} 6' N.$ , long.  $154^{\circ} 20' E.$ "

p. 202;—**Minto reef** was passed by Captain JONES of the *Ada*, from Australia to China, in 1868; "the sea was breaking heavily on its outer edge; it is very dangerous, being nearly all awash except a small white patch on the eastern side, and a few small rocky heads; the limit of breakers to the northward not visible from the mizen topsail yard; S.E. point in lat.  $8^{\circ} 4' N.$ , long.  $154^{\circ} 19' E.$ "

The *Britomart*, also, on a voyage from Australia to Hongkong (1869) passed close to it, and Capt. BARTLETT describes the reef as being 10 miles long, east and west, and level with the water except near the northern part, where it rises about 6 feet above the sea. The position as given, lat.  $8^{\circ} 10' N.$ , long.  $154^{\circ} 34' E.$ , was found to be correct.

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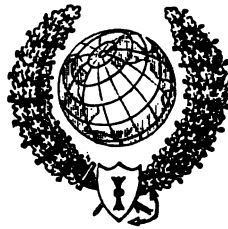
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     On cloth for Captains' use ... .. 13/9  
     On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 6 in. by 3 ft. 5 in. ... .. 31/6

22. **ENGLAND (East Coast of), from Orfordness to Flamborough Head,** with plans of the River Humber, Yarmouth Roads, and Bridlington Bay, and illustrated with views of the coast. On two sheets. Accompanied with a Book of Directions ... .. 8/-  
     On cloth for Captains' use ... .. 10/6  
     On cloth and rollers for Counting-house, coloured and varnished; size 4 ft. 4 in. by 3 ft. 5 in. ... .. 21/-

NOTE.—This chart and the charts of the Estuary of the Thames, Nos. 8, 9, or 10, will show the navigation from Dover and London to Hull, on a very large scale.

23. **ENGLAND (East Coast of), from Orfordness to Flamborough Head.** On one sheet. Drawn from recent Admiralty Surveys ... .. 4/-  
     On cloth for Captains' use ... .. 5/3

24. **EAST COAST OF ENGLAND, from Orfordness to the River Tyne,** with plans on a large scale of the River Humber, Yarmouth Roads, Bridlington Bay, Sunderland, Whitby, Scarborough, Hartlepool, and the River Tyne. On three large sheets. With descriptive notes of the harbours, views of headlands, and of the coast. Accompanied with a Book of Sailing Directions ... .. 10/-  
     On cloth for Captains' use ... .. 13/9  
     On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... .. 31/6

NOTE.—This chart, with Nos. 8, 9, or 10, will show the navigation from London or the Downs to Newcastle on a very large scale.

25. **YARMOUTH and LOWESTOFT ROADS.** A small plan chart, showing all the leading marks, lights, &c. ... .. 1/-

220. **ENGLAND and SCOTLAND (the Coast included between Flamborough Head and the Shetland Islands).** On four large sheets. Compiled from recent surveys. With plans of almost all the harbours included within its limits. Accompanied with a Book of Directions ... .. 14/-  
     On cloth for Captains' use ... .. 19/-

This chart shows the east coast of the British Islands northward of Flamborough Head on a very large scale. If taken with charts Nos. 8 or 10, and 22 it will show the navigation from the Downs to the Shetland islands; or, with chart No. 21 from Dungeness to Lerwick; or it may accompany chart No. 38 (page 7).

Or, the chart may be had in two parts—

- 220a. **FLAMBOROUGH HEAD to KINNAIRD HEAD.** With a Book of Directions ... .. 8/-

- 220b. **KINNAIRD HEAD to the ORKNEYS and SHETLAND.** With a Book of Directions ... .. 8/-

26. **ENGLAND and SCOTLAND (the Coast included between Flamborough Head and the Orkneys),** being the three southern sheets of chart No. 220. With plans of all the principal harbours included within its limits. With a Book of Directions ... .. 12/-  
     On cloth for Captains' use ... .. 15/9  
     On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... .. 31/6

27. **ENGLAND and SCOTLAND (East Coast of), from Flamborough Head to the Orkney Islands,** with plans of Harbours, and a full description of the signals exhibited at Sunderland and Hartlepool. Compiled from recent surveys. One sheet. A reduction of chart No. 220 ... .. 4/-  
     On cloth for Captains' use ... .. 5/3

221. **ENGLAND and SCOTLAND (the Coast included between Flamborough Head and the Firths of Forth and Tay).** Compiled from recent surveys. With plans of Scarborough, Filey bay, Tees bay and Hartlepool. Seaham, Sunderland, the entrance to the Tyne, Blyth, Berwick, Farn islands, Holy Island harbour, Coquet island and channel, Leith harbour, Dundee, Arbroath and Montrose. Accompanied with a Book of Directions ... .. 14/-  
     On cloth for Captains' use ... .. 19/-

This magnificent chart is on four large sheets, and shows the coast on the largest scale yet published, the scale being 18½ inches to a Degree of Longitude. With charts Nos. 8 and 22 it shows the navigation between the Downs and the Firth of Tay; or with Nos. 20 or 21, the navigation between the English Channel and the coast of Scotland as far northward as Montrose; or it may be taken as an accompaniment to chart No. 38. Shipmasters proceeding to Leith or Dundee are also recommended to provide themselves with chart No. 29.

- 222. COAL PORTS of YORKSHIRE, DURHAM, and NORTHUMBERLAND.** The coast of England included between Flamborough head and Coquet island; being the two southern sheets of chart No. 221. With plans of Whitby, Scarborough, the entrance to the Tees and Hartlepool bay, Seaham, Sunderland, the entrance to the Tyne, Blyth, and Coquet roadstead ... 8/-  
On cloth for Captains' use ... 10/6

This is a very useful publication for shipmasters bound from southward to any of the ports between Bridlington bay and Warkworth. It is a convenient accompaniment to charts Nos. 8 or 10, with 21 or 22; or it may accompany chart No. 38.

- 29. FIRTHS of FORTH and TAY.** This chart of the rivers is on a very large scale and contains plans of the harbours of Leith, Granton, Burntisland, Anstruther, Crail, Pittenweem, Kirkcaldy, Dysart, Buckhaven, Elic, St. Andrews, Dundee, Arbroath, &c. &c. Accompanied by a Book of Sailing Directions, which contains Coloured Drawings of the Signals used at the various Ports. On two sheets ... 8/-  
On cloth for Captains' use ... 10/6

- 30. FIRTHS of FORTH and TAY.** With plans of Leith roadstead, and several of the most important Harbours. On one sheet, and on a much smaller scale than Chart No. 29. Accompanied with a Book of Sailing Directions ... 5/-

- 31. WEST COAST and ISLANDS of SCOTLAND** (from the Mull of Cantyre to Cape Wrath and the Lewis Islands). On three large sheets. With plans of harbours. Accompanied with a Book of Directions ... 12/-  
On cloth for Captains' use ... 15/9

- 32. NORTH COAST of SCOTLAND** (Cape Wrath to Pentland Firth) including the Orkney Islands. One large sheet ... 5/-  
On cloth for Captains' use ... 6/3

- 19. FIRTH of CLYDE and NORTH CHANNEL,** showing the navigation along the north coast of Ireland, and from the Irish Channel to Glasgow and Greenock. Drawn from recent Admiralty surveys and improved by the introduction of several plans of harbours. On two large sheets ... 8/-  
On cloth for Captains' use ... 10/6  
On cloth and rollers for Counting-house, coloured and varnished; size 4 ft. 4 in. by 3 ft. 5 in. ... 24/-

- 13. BRISTOL CHANNEL** (Hartland Point and the Smalls to Bristol and Gloucester). On three large sheets. Drawn from recent Admiralty surveys, and accompanied with a Book of Directions ... 10/-  
On cloth for Captains' use ... 13/9  
On cloth and rollers for Counting-house, coloured and varnished; size 5 ft. 2 in. by 3 ft. 3 in. ... 31/6

- 14. IRISH (or St. GEORGE'S) and BRISTOL CHANNELS** (Trevose Head, Cornwall, to the Firth of Clyde), with numerous plans of harbours, and illustrated with views of the coast, lighthouses, beacons, &c. On three large sheets. Drawn from recent Admiralty surveys, and accompanied with a Book of Directions ... 12/-  
On cloth for Captains' use ... 15/9  
On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6

- 261. IRISH AND BRISTOL CHANNELS.** The same chart as No. 14, but with a Supplementary Sheet to show the navigation southward, round Cornwall and the Scilly Islands, as far eastward as Plymouth and Dartmouth. With plans of harbours, and of the Longships rocks. Limits: latitude 49° 36' to 56° 1' N, longitude 2° 32' to 7° 20' W. With a Book of Directions... 14/-

\* \* This chart, with No. 4, will show the navigation from the Downs to Bristol, Cardiff, Dublin, Liverpool, Belfast, and Glasgow.

- 15. IRELAND** (The West, South-West, and North Coasts of), from Waterford to Lough Foyle. An accompanying chart to that of the Irish Channel, Nos. 14 or 261 preceding. Compiled from recent Admiralty surveys. With a Book of Directions. On three large sheets... 12/-  
On cloth for Captains' use ... 15/9  
On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6

- 16.\* NAVIGATION round IRELAND, with numerous plans of harbours.** With Sailing Directions ... .. 12/-  
     On cloth for Captains' use ... .. 17/-  
     On cloth and rollers for Counting-house, coloured and varnished ... .. 31/6

\* This publication (No. 16) was formerly issued in this form only, but its size being very inconvenient, it is now also arranged in two charts. An advantage which follows from this is, that we are enabled to give more plans of harbours than hitherto. The chart is divided into two, as follows (Nos. 17 and 18), but in this form is not accompanied with a Book of Directions. A Book for each chart can be had if required, at an extra charge.

- 17. IRISH CHANNEL.** With plans of Belfast, North Rocks, Maidens, &c., Tuskar Rocks, Skerries Rocks, &c., Milford Haven, South Coast of Man, and entrance to Lough Foyle... .. 5/-  
     On cloth for Captains' use ... .. 7/6
- 18. West Coast of IRELAND.** With plans of Clew Bay, Broadhaven, Killala Bay, Killybegs, Sligo Harbour, Teelin Harbour, Kinsale, Galway Harbour, Tralee Bay, Valentia Harbour, and Crookhaven ... .. 5/-  
     On cloth for Captains' use ... .. 7/6

- 206. ENGLAND and SCOTLAND PILOT.** Containing the following Charts, viz. :—No. 1, The River Thames. No. 2, The East Coast of England, from Orfordness to Flamborough Head. No. 3, The East Coast of England and Scotland ... .. 10/-

## *North Sea, Kattegat, and Baltic.*

- 36. NORTH SEA,** on two large sheets, showing the navigation between the coasts of England and Scotland, and the opposite coasts of France, Holland, Jutland, and Norway. With plans of harbours. Illustrated with numerous views of the Lighthouses. Accompanied with a Book of Directions ... .. 8/-  
     On cloth for Captains' use ... .. 10/6
- 37. NORTH SEA.** The same chart as the preceding, but with the addition of a half sheet to show the coast of Norway as far as Drontheim. Illustrated with numerous views of the coast, and improved by a full description of the Currents, Tides, &c., and remarks on the passage across the North Sea. Accompanied with a Book of Directions ... .. 10/-  
     On cloth for Captains' use ... .. 13/9
- 38. SOUTHERN PART of the NORTH SEA** from Dungeness to Flamborough Head on the English side; with the opposite coasts of France, Holland, and Germany, from Calais to Hamburg. With plans of Bridlington and Dover bays, the Downs, Dunkerque Roads, Flushing Roads, the entrance to the Hook of Holland Canal, port Ymuiden, the Texel Channels, Helgoland, and entrance to the river Elbe. On three sheets. Accompanied with a Book of Directions 12/-  
     On cloth for Captains' use ... .. 15/9  
     On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... .. 31/6
- 217. ENGLAND to GRONINGEN,** being two sheets of Chart No. 38. With plans of Bridlington and Dover bays, the Downs, Flushing Roads, port Ymuiden, and entrance to the Hook of Holland Canal ... .. 8/-
- 39.\* FLEMISH BANKS, &c.** A large chart, on two sheets, showing the navigation between the River Thames and the ports on the north coast of France (Calais, Ostende, Dunkerque, &c.), the River Schelde to Antwerp, Rotterdam, &c. It comprises the North Sea south of latitude 52° 23' N., and is accompanied with a Book of Sailing Directions ... .. 8/-  
     On cloth for Captains' use ... .. 10/6
- 40.\* NORTH SEA (Rivers Thames and Maas to the Texel).** A large chart, on two sheets, showing the navigation north of the chart of the Flemish Banks, &c., just described, and comprising all the sea included between Orfordness and ... .. 8/-

41. \* **NORTH SEA** (Coast of Holland and Prussia from the Texel to Hamburg). A chart, on three large sheets, showing the entrances to the Rivers Elbe, Weser, Ems, Jade, and Hever. Compiled from recent surveys. Accompanied with a Book of Directions ... .. 12/-

On cloth for Captains' use ... .. 15/9

On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 8 in. by 3 ft. 6 in. .... 31/6

\* The charts Nos. 39, 40, 41 are on the same scale, and show the navigation from the English Channel to Hamburg. They form a complete series of charts of the North Sea southward of Hamburg.

42. **SKAGERRAK, or SLEEVE**, extending from the Naze of Norway to Gothenburg. On a large scale. With numerous plans of harbours. Illustrated with views of Beacons and Headlands. On two sheets ... .. 8/-

On cloth for Captains' use ... .. 10/6

228. **ENTRANCE TO THE KATTEGAT**. A large chart on 2½ sheets, showing the navigation between Christiania and Anholt island. With plans of the approach to Frederikstad, entrance to Gullmar and Aby fiords, entrance to Marstrand fiord, Gothenborg bay, Kongsbacka fiord, Nidingen island and reefs, &c. With a Book of Directions. Limits: latitude 56° 41' to 60° 5' N, longitude 9° 23' to 13° 27' E. .... 10/-

On cloth for Captains' use ... .. 13/9

229. **THE BELTS AND SOUND**. A large chart on two sheets, showing the navigation between Anholt island and the ports of Apenrade, Flensburg, Schleswig, Eckernforde, Kiel, Neustadt, Elsinore (Helsingor), Copenhagen, Malmo, Travemunde, Wismar, Rostock, Stralsund, &c. &c. With plans of harbours. Accompanied by a Book of Directions. Limits: latitude 53° 53' to 56° 52' N, longitude 9° 23' to 13° 27' E. .... 8/-

On cloth for Captains' use ... .. 10/6

These two charts (Nos. 228, 229) are on the same scale, and are intended to accompany each other. They show the navigation between Christiania fiord and the port of Kiel; consequently, the route through the Kattegat into the Baltic.

43. **KATTEGAT** (the navigation between the Skaw and Elsinore). Compiled from recent Danish surveys. On two large sheets. Illustrated by numerous views of the coast, and accompanied with a Book of Sailing Directions ... .. 8/-

On cloth for Captains' use ... .. 10/6

44. **KATTEGAT, SOUND AND BELTS**. A large chart on three sheets, showing the navigation from Skagen point through the Belts and Sound into the Baltic. With plans of the principal harbours. Accompanied by a Book of Directions. Limits: latitude 53° 53' to 58° 10' N, longitude 9° 23' to 13° 27' E. .... 12/-

On cloth for Captains' use ... .. 15/9

This chart is three sheets of the charts Nos. 228 and 229. It is published in this form as a convenient accompaniment to the chart of the Skagerrak (No. 42).

45. **THE BELTS**. A large chart, on two sheets, showing the navigation from the Kattegat into the Baltic. This chart is on the same scale as that of the Kattegat (No. 43), and is intended to accompany that chart. It is for the use of such Shipmasters as prefer the wide and clear navigation through the Great Belt to the nearer but more confined passage into the Baltic through the Sound. Accompanied with a Book of Directions ... .. 8/-

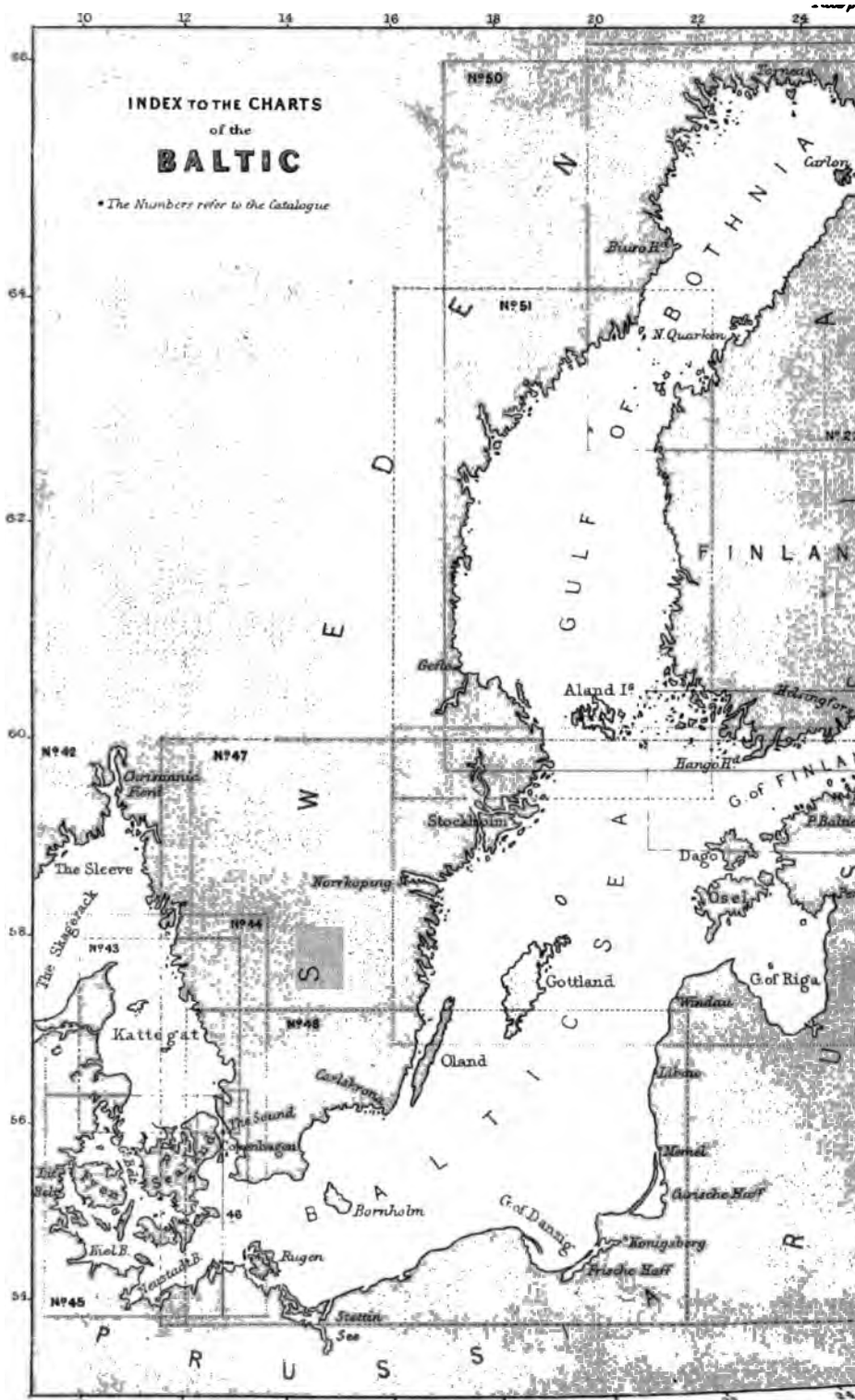
On cloth for Captains' use ... .. 10/6

46. **SOUND**. On two large sheets. With plans of the Channel of Elsinore, and the Channel of Copenhagen. Compiled from recent surveys ... .. 7/-

On cloth for Captains' use ... .. 9/6

47. **BALTIC (the Sound to the Gulf of Finland and Gulf of Bothnia)**. With plans of harbours. Drawn from the latest surveys made by order of the Governments of Germany, Sweden, Denmark, and Russia. On two large sheets. A new chart. Accompanied with a Book of Directions ... .. 8/-

- 48.† **BALTIC (South Part of)**, on three large sheets, and with many plans of harbours. Shows the navigation from the Sound to Danzig, Pillau, Memel, the south end of the island of Gotland, &c. Limits: latitude 53° 45' to 57° 13' N.; longitude 12° 0' to 21° 55' E. With a Book of Directions ... .. 10/-







No 53

No 58

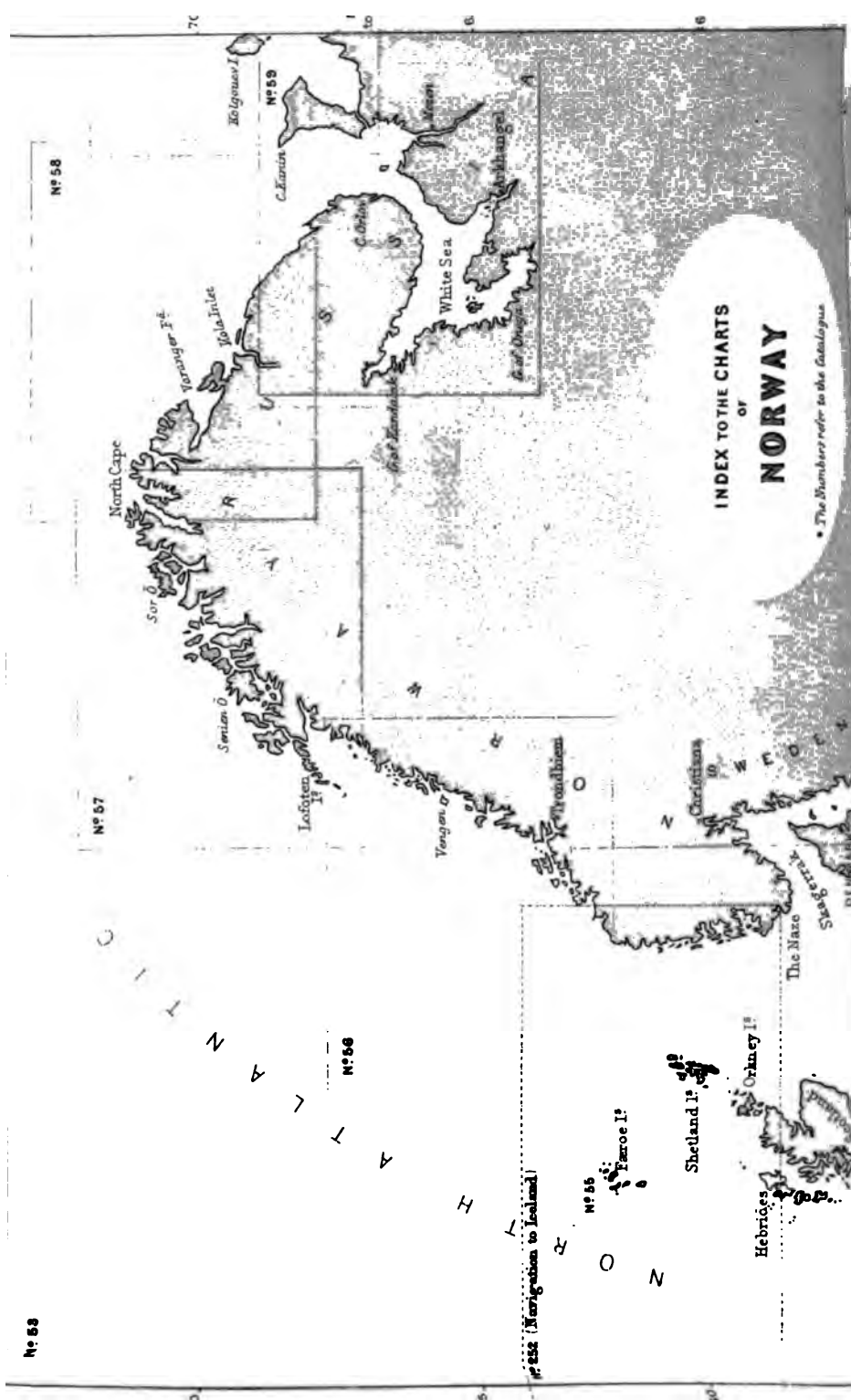
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No 55

# INDEX TO THE CHARTS or NORWAY

The Numbers refer to the Catalogue



- 49.† **BALTIC (North Part of)**, on three large sheets, on the same scale as the preceding chart, and with many plans of harbours. It shows the navigation from the south end of Gottland to Riga, the Gulfs of Finland and Bothnia, Stockholm, &c. Limits: latitude  $56^{\circ} 52'$  to  $60^{\circ} 5'$  N., longitude  $16^{\circ} 0'$  to  $25^{\circ} 55'$  E. ... 10/-
- 50.† **GULF of BOTHNIA**, on  $2\frac{1}{2}$  large sheets. With plans of the North Quarken and the harbours of Gamla Carleby, and Hudiksvall. Compiled from the recent surveys made by order of the Swedish Government. Accompanied with a Book of Directions ... 10/-
- 51.† **GULF of BOTHNIA (South of the North Quarken)**. A large chart on three sheets, on the same scale as the preceding charts (North and South Baltic, Nos. 48 and 49) and intended to accompany them. With plans of harbours, and accompanied with a Book of Directions ... 10/-
- 223.† **GULF OF BOTHNIA (North of the North Quarken)**. This chart shows the navigation from Umea to Tornea and Uleaborg, at the head of the gulf, and is on the same scale as charts No. 48, 49, and 51. On two large sheets. With a Book of Directions ... 8/-  
On cloth for Captains' use ... 10/6
- 52.† **GULF of FINLAND**, on three large sheets, showing the whole navigation between Dager-ort and St. Petersburg. With plans of Kronstat, Port Baltic or Rager Wik, Revel and Hango Harbours. Illustrated with numerous views of the coast, and accompanied with a Book of Directions ... 10/-

† These are all new charts, engraved in the best and clearest style. They show the navigation from the North Sea to the Gulf of Bothnia or Gulf of Finland on the largest scale yet published. Shipmasters bound to St. Petersburg should provide themselves with Nos. 37, 42, 43, 45, 46, 48, 49 and 52; or, if bound to the Gulf of Bothnia, Nos. 50 (or 51 and 223), instead of No. 52. If required to be mounted on cloth, the price of each chart will be 3/9 extra.

## Norway, Lapland, and North Russia.

53. **NORWAY and LAPLAND**, showing the navigation between the North and White Seas. With plans of the vicinity of Hammerfest and Tromsøe, the port of Drontheim, and the bay of Arkhangel. On two large sheets. Accompanied with a Book of Directions ... 8/-  
On cloth for Captains' use ... 10/6
54. **BRITISH ISLANDS to the GULF of OBI**. The same chart as No. 53, but with two additional sheets to show the navigation eastward of the White Sea. With a large plan of Petshora Bay. (In preparation.)
55. **BRITISH ISLANDS to the WHITE SEA (Chart No. 1)**. On two large sheets. Limits: latitude  $56^{\circ} 0'$  to  $63^{\circ} 5'$  N., longitude  $9^{\circ} 40'$  W. to  $9^{\circ} 40'$  E... 8/-
56. **BRITISH ISLANDS to the WHITE SEA (Chart No. 2)**. On two large sheets. Limits: latitude  $62^{\circ} 10'$  to  $68^{\circ} 0'$  N., longitude  $2^{\circ} 15'$  W., to  $16^{\circ} 0'$  E. ... 8/-
57. **BRITISH ISLANDS to the WHITE SEA (Chart No. 3)**. On two large sheets. Limits: latitude  $67^{\circ} 10'$  to  $72^{\circ} 0'$  N., longitude  $9^{\circ} 35'$  to  $28^{\circ} 0'$  E. 8/-
58. **BRITISH ISLANDS to the WHITE SEA (Chart No. 4)**. On two large sheets. Limits: latitude  $68^{\circ} 0'$  to  $72^{\circ} 35'$  N., longitude  $25^{\circ} 35'$  to  $44^{\circ} 0'$  E. 8/-
59. **BRITISH ISLANDS to the WHITE SEA (Chart No. 5)**. Showing the WHITE SEA. On two large sheets. With plans of Arkhangel, Sosnovets, Veshnyak, Nokuev, Sem Islands, Iukanskic and Onega Harbours, the Gulf of Onega, &c. Illustrated with numerous views of the coast, and improved by many explanatory notes. Limits: latitude  $63^{\circ} 46'$  to  $69^{\circ} 0'$  N., longitude  $31^{\circ} 30'$  to  $47^{\circ} 30'$  E. Accompanied with a Book of Directions ... 8/-  
On cloth for Captains' use ... 10/6

- 12. BRITISH ISLANDS to the WHITE SEA and PETSHORA BAY**  
 (Chart No. 6). Showing the navigation eastward of the White Sea to Petshora Bay. With a large plan of the Bay. On two large sheets ... 8/-  
 On cloth for Captains' use ... 10/6

Shipmasters going to Arkhangel should take charts Nos. 53, 55, 56, 57, 58, 59, as those publications exhibit the whole voyage to the White Sea. With the exception of No. 53 (a general chart for the whole navigation) the charts are all on the same scale and each contains many plans of harbours. The series is accompanied with a small Index chart (for which no charge is made), and it is requested that purchasers ask for it, if it be not supplied.

## *Sea west and north of the British Islands, including Iceland.*

- 33. SEA NORTH-WEST of the BRITISH ISLANDS**, with plans of the Caledonian Canal and Rockall Bank. This chart is specially adapted to the use of Shipmasters frequenting Rockall Bank and the Færoe Islands in pursuit of the Fishery, as it shows Rockall Bank on a large scale. On two large sheets. Limits: latitude  $53^{\circ} 50'$  to  $63^{\circ} 35'$  N., longitude  $0^{\circ} 30'$  to  $15^{\circ} 40'$  W. ... 8/-  
 On cloth for Captains' use ... 10/6
- 34. WEST COAST of the BRITISH ISLANDS**. The same chart as No. 33 (Sea north-west of the British Islands), but with an additional sheet. This chart shows the whole of the Irish Channel, the coast round Ireland, the Bristol Channel, and the English Channel west of the Isle of Wight; it also exhibits the navigation west of the British Islands between the English Channel and the Færoe Islands. Limits: latitude  $48^{\circ} 20'$  to  $63^{\circ} 35'$  N., longitude  $0^{\circ} 30'$  to  $15^{\circ} 40'$  W. On three sheets ... 10/-  
 On cloth for Captains' use ... 13/9
- 35. FÆROE ISLANDS to the BAY of BISCAY**. On four large sheets. 12/-  
 On cloth for Captains' use ... 17/-
- 251. NORWAY and LAPLAND to ICELAND**. This chart shows the navigation from the North and White Seas to Iceland, also from the north part of Scotland to Iceland. It contains plans of Jan Mayen Island, the Færoe Islands, Thorshaven (Færoe Islands), Hammerfest, Tromsøe, Drontheim and Arkhangel. On three large sheets ... 12/-
- 252. NORTH SEA to ICELAND**. A large chart on three sheets, showing the navigation to Iceland from the North Sea, the western coast of Norway, and the northern part of Scotland. With a plan of Bergen and the south channel leading to it; also one of Reikiavik bay and harbour. Limits: latitude  $58^{\circ} 35'$  to  $67^{\circ} 10'$  N., longitude  $12^{\circ} 0'$  E. to  $25^{\circ} 40'$  W. ... 12/-  
 On cloth for Captains' use ... 15/9
- 253. BRITISH ISLANDS to ICELAND**. Two sheets of chart No. 252 8/-  
 On cloth for Captains' use ... 10/6
- 254. ICELAND**. A large chart on two sheets. This publication also shows all that is known of the interior of the island; consequently it is as useful to the traveller as the yachtsman ... 8/-  
 On cloth for Captains' use ... 10/6





## *Atlantic Ocean.*

263. **ATLANTIC.** A chart showing the navigation from Europe and North America to Cape Horn and the Cape of Good Hope. On two large sheets ... 8/-  
This Chart may also be had in two parts, as follows : No. 264, 265.
264. **NORTH ATLANTIC (Europe and North America to the Equator).**  
On one large sheet ... .. 4/-
265. **SOUTH ATLANTIC (the Equator to Cape Horn and the Cape of Good Hope).** On one large sheet ... .. 4/-
60. **ATLANTIC (Northern Part).** On three large sheets. Limits : latitude  $31^{\circ}$  N. to  $61^{\circ}$  N., longitude  $5^{\circ}$  E. to  $83^{\circ} 20'$  W. A very useful chart for the North American trade, as it shows the northern part of the Atlantic on an unusually large scale. With plans of the coast in the vicinity of Cape Race (Newfoundland), Sable Island, and St. George's Bank (United States). With a Book of Directions ... .. 12/-
61. **NORTH ATLANTIC, from Greenland to the Equator, on a very large scale ;** with plans of the harbour of Funchal, Horta and Pim Bays, and Fayal Channel, and Bermuda Islands. Illustrated with some views. This chart contains much valuable information on the winds and currents. ... .. 8/-  
On cloth for Captains' use ... .. 10/6  
On cloth and rollers for Counting-house, coloured and varnished ; size 4 ft. 4 in. by 3 ft. 5 in. ... .. 21/-
62. **Short Notes on the North Atlantic.** A small pamphlet containing Sailing Directions and remarks on making passages across the North Atlantic, price 1/6, to accompany this chart.
63. **NORTH ATLANTIC (Chart showing the Currents).** The same chart as No 61, but with the currents distinctly shown in colour, and with an additional sheet of plans, consisting of Track, Magnetic, Tidal and Wind Charts. Accompanied by the pamphlet No. 62 "Short Notes on the North Atlantic" ... 12/-  
On cloth for Captains' use ... .. 15/9
64. **SOUTH ATLANTIC, on two large sheets, from the Equator to  $65^{\circ}$  south latitude, on a very large scale ;** with plans of the islands of St. Helena, Ascension, Trinidad, Martin Vas, Fernando Noronha, Rocas Reef, &c. Illustrated with some views. Much valuable information on the winds, currents, and temperature of the water is embodied in this chart ... .. 8/-  
On cloth for Captains' use ... .. 10/6  
On cloth and rollers for Counting-house, coloured and varnished ; size 4 ft. 4 in. by 3 ft. 5 in. ... .. 21/-
65. **Short Notes on the South Atlantic.** A small pamphlet containing Sailing Directions and remarks on making passages across the South Atlantic, price 1/- to accompany this chart.
66. **SOUTH ATLANTIC (Chart showing the Currents).** The same chart as No. 64, but with the currents distinctly shown in colour, and with an additional sheet of plans, consisting of Track, Magnetic, Tidal, and Wind Charts. Accompanied by the pamphlet No. 65 "Short Notes on the South Atlantic" 12/-  
On cloth for Captains' use ... .. 15/9

NOTE.—This chart, with the chart of the North Atlantic, No. 63, shows the whole navigation from Europe and the United States to the Cape of Good Hope and Cape Horn, and will be found very serviceable, as the directions of all the known currents are delineated.

## *Scattered Islands in the Atlantic.*

67. **AZORES or WESTERN ISLANDS.** One sheet, on a very large scale. With numerous plans of harbours. Drawn principally from recent Admiralty surveys. A beautifully engraved chart ... .. 4/-  
On cloth for Captains' use ... .. 5/3

68. **MADEIRA, PORTO SANTO, and the DEZERTAS**, on one sheet, with a plan of the harbour of Funchal, and illustrated with some views. Drawn from recent Admiralty surveys ... 4/-  
On cloth for Captains' use ... 5/3
69. **CANARY ISLANDS**. With plans of harbours. Illustrated with some views. 4/-  
On cloth for Captains' use ... 5/3
70. **CAPE VERDE ISLANDS**, on a very large scale. With plans of Porto Grande, Praya, Mordeira, English Road; the most important harbours in the group. Numerous views of headlands, and remarks upon making the harbours. Drawn chiefly from Admiralty surveys ... 4/-  
On cloth for Captains' use ... 5/3

### *Atlantic Coast of France and Spain; including Portugal.*

- 73.\* **BRITISH ISLANDS TO THE COAST OF AFRICA**, showing the navigation from Liverpool and Ireland to Mogador. With plans of all the principal harbours. On four large sheets. With a Book of Sailing Directions 12/-  
On cloth for Captains' use ... 17/-
- 74.\* **FRANCE, SPAIN, and PORTUGAL (the West Coasts of)**, extending from the entrance of the Irish Channel to Gibraltar. With plans of all the principal harbours. Accompanied with a Book of Directions ... 10/-  
On cloth for Captains' use ... 13/9  
On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6
- \* Either of these charts with No. 33, will show the navigation from the Færoe Islands to the Mediterranean.
- 75.† **BRITISH ISLANDS to the MEDITERRANEAN, CANARIES, MADEIRAS, and AZORES**. On two very large sheets, and with plans of harbours. Limits: latitude 26° N. to latitude 56° N.; longitude 0° 40' W. to 31° 30' W. ... 8/-  
On cloth for Captains' use ... 10/6
- † This is a very useful chart, specially intended for the fruit trade and shipmasters bound to the Azores or Mediterranean.
- 76.‡ **BAY of BISCAY**. Drawn from recent surveys made by order of the French Government. With plans of the principal harbours. On two large sheets. Accompanied with a Book of Directions ... 8/-  
On cloth for Captains' use ... 10/6
268. **WEST COAST OF FRANCE (Brest to Bordeaux)**. A large Chart on three sheets, with plans of Quiberon bay, the mouth of the Gironde, and the port of Sables d'Olonne. Compiled from recent French surveys. With a Book of Directions ... 12/-
269. **WEST COAST OF FRANCE (Approaches to Brest)**. A large sheet showing Ouessant island and channel, the Chaussée de Sein, Douarnenez bay, and Brest roadstead. With plans on a very large scale of the Chenal du Four, the Goulet de Brest, and Brest harbour and its dock accommodation. Compiled from recent French surveys ... 5/-
- 77.‡ **COAST of SPAIN and PORTUGAL (Cape Ortegal to the Strait of Gibraltar)**. With plans on a large scale of the harbours of Cadiz and Setuval, the rivers Guadalquivir, Odiel, Tinto, Tagus and Douro, Burling islands, and the bays of Arosa, Pontevedra, Vigo, Corcubion and Muros. Drawn from Spanish and Portuguese surveys. On three large sheets. Accompanied with a Book of Sailing Directions ... 12/-  
On cloth for Captains' use ... 15/9
- ‡ Charts Nos. 76 and 77 show the navigation from the English Channel to the Mediterranean. They are on the same scale, and follow the one from the other.
78. **COAST of PORTUGAL and SPAIN, from Cape San Vicente to Gibraltar**. On a very large scale. With plans of the principal harbours; Cadiz, the Rivers Odiel, Guadalquivir, &c. This chart is from recent surveys, and published specially for the trade to Pomeron and Seville ... 5/-  
On cloth for Captains' use ... 6/3





## *Mediterranean.*

79. **MEDITERRANEAN.** On four large sheets, and containing about thirty plans of harbours, &c., among which are the following :—Malaga, Alicante, Barcelona, Villefranche, Strait of Gibraltar, Cartagena, Genoa, Hyeres Road, Leghorn, Toulon, Cagliari, Algiers, Strait of Bonifacio, Gulf of Naples, Palermo, Strait of Messina, Valetta, Smyrna, River Danube, Alexandria, Cephalonia, Trieste, Patras, &c. Illustrated with numerous views of the coast, and descriptive notes. Drawn from recent surveys made by order of the British, French, Austrian, and Russian Governments. A beautifully engraved and elegant chart ... 12/-  
On cloth for Captains' use ... 17/-  
On cloth and rollers for Counting-house, coloured and varnished ; size 8 ft. 4 in. by 3 ft. 4 in. ... 42/-  
This chart may also be had in two Parts, as follows :—
80. (Part I.)—**Gibraltar to the Adriatic**, on two large sheets. This chart shows the navigation between the coast of Spain and the ports in the Adriatic, and contains many plans of harbours ... 7/-  
On cloth for Captains' use ... 9/6
81. (Part II.)—**Italy to Alexandria**, on two sheets. This chart comprises the navigation between the Adriatic, Black Sea, and the Levant, and contains numerous plans of harbours ... 7/-  
On cloth for Captains' use ... 9/6
- 82.\* **MEDITERRANEAN (Western Portion of)**, on three large sheets, showing the navigation between Gibraltar and Malta on the most extensive scale yet published. With numerous plans of harbours. Accompanied with a Book of Directions. (A new chart.) ... 12/-  
On cloth for Captains' use ... 15/9
- 83.\* **MEDITERRANEAN (Eastern Portion of)**, on four large sheets, showing the navigation between Sicily and Malta and the coast of Egypt and Syria, on a very large scale. With numerous plans of harbours. Accompanied with a Book of Directions. (A new chart.) ... 12/-  
On cloth for Captains' use ... 19/-
- \* These two charts (Nos. 82 and 83) show the whole navigation from Gibraltar to Alexandria and the coast of Syria, on a very large scale. The chart No. 83 being very large, may be had in two parts, as in Nos. 84 and 85.
84. **MEDITERRANEAN (Middle Portion of)**, on two large sheets, showing the navigation between Sicily and Malta and the Grecian Archipelago. Accompanied with a Book of Directions ... 8/-
85. **MEDITERRANEAN (Levant Portion).** On two large sheets, showing the navigation between the Grecian Archipelago and the coast of Egypt and Syria. With plans of the most important harbours. Compiled from recent surveys. Accompanied with a Book of Directions... 8/-
230. **GULF OF LYONS.** A chart on two large sheets, showing the South Coast of France and the navigation thence to the Strait of Bonifacio. With plans of the harbours of Marseille, Cette, Ciotat, Bandol, St. Nazaire bay, Nice, Villa Franca, Savona, Vado, Portofino, Livorno (Leghorn), Toulon, and Hyeres bay. Limits : latitudes  $40^{\circ} 25'$  and  $45^{\circ} 0' N.$ , longitudes,  $2^{\circ} 50'$  and  $10^{\circ} 50' E.$  With a Book of Directions. ... 8/-
260. **SOUTH COAST OF FRANCE, and WEST COAST OF ITALY,** as far south as Naples. The same chart as No. 230, and consequently containing all the plans of harbours in that chart, but with an additional sheet to show the navigation from Marseille, through Bonifacio strait, to Naples. The extra plans are Bonifacio strait, Genoa, Piombino channel, Spezia gulf, Naples, Gaeta, Civita Vecchia, Procida and Ischia channels. Limits : latitudes  $40^{\circ} 25'$  and  $45^{\circ} 0' N.$ , longitudes  $2^{\circ} 50'$  and  $14^{\circ} 50' E.$  With a Book of Directions ... 10/-

86. **ADRIATIC**, on two large sheets, with numerous plans of harbours and views of the coast. Accompanied with a Book of Sailing Directions ... 8/-  
On cloth for Captains' use ... 10/6
87. **GRECIAN ARCHIPELAGO**. On two large sheets. With plans of Cervi, Skiatho, and Doro channels, the harbours of Syra, Kalamitza, and Sigri; Salamis and Saloniki bays, the gulf of Smyrna and Khios strait, &c. Drawn chiefly from recent British surveys. Accompanied with a Book of Sailing Directions ... 10/-
88. **GIBRALTAR STRAIT**. A sheet showing the Strait on a very large scale ... 2/-
89. **COAST of SPAIN** (Gibraltar to Cape San Antonio), with plans of Cartagena, Malaga, Torre Vieja, Alicante, Almazarron, Almeria, Porman, Aguilhas, Portus, Carbonera, Mount Cope, Grosa island, Benidorme, Herradura bay, Ceuta bay, Alboran island, &c. ... 5/-  
On cloth for Captains' use ... 6/3
90. **COAST of SPAIN** (Cape San Antonio to Cape San Sebastian, including the Balears Islands), with plans of Barcelona, port Mahon, Valencia, Mattaro, Palma, Tarragona, Alfaques, Salou, Denia, Iviza, Cabrera, Palamos, Fangal, Solier, cape Cullera, Columbretes islands, and the channel between Iviza and Formentera ... 5/-  
On cloth for Captains' use ... 6/3
91. **ALEXANDRIA** (the port of Alexandria and coast in its Vicinity). A chart showing the coast of Egypt in the vicinity of Alexandria, on a large scale, with plans of Alexandria harbour and New Port. Published specially for the trade to Alexandria ... 5/-  
On cloth for Captains' use ... 6/3
227. **COAST OF EGYPT and APPROACHES TO PORT SAID**. A large chart on two sheets showing the Delta of the Nile, and the coast of Egypt eastward from Alexandria to port Said. Also, the Suez Canal, and the port of Suez. ... 8/-  
On cloth for Captains' use ... 10/6
92. **SUEZ CANAL and PORT SAID**. A large chart on one sheet. With a Book of Directions ... 3/6
93. **SUEZ CANAL and GULF OF SUEZ**. A chart showing the navigation between port Said and the Upper or Northern (the most dangerous part) portion of the Red Sea. If this chart be taken in connexion with charts Nos. 204, 205, see page 23, the navigation from the Mediterranean to the Indian Ocean will be shown on a large scale. With a Book of Directions ... 7/-  
On cloth for Captains' use ... 9/6
94. **DARDANELLES**, on one sheet. With plans of the Tenedos channel, Narrows of the Dardanelles and Lamsaki bay ... 5/-  
On cloth for Captains' use ... 6/3
95. **SEA of MARMORA**, on one sheet. With numerous plans of harbours ... 5/-  
On cloth for Captains' use ... 6/3
96. **BOSPHORUS**. On a very large scale. With a plan of the Golden Horn and Oumour bay ... 5/-  
On cloth for Captains' use ... 6/3
97. **RIVER DANUBE** (Sulina Harbour to Galatz). On a very large scale. With a plan of Sulina harbour ... 5/-  
On cloth for Captains' use ... 6/3
98. **BLACK SEA and SEA of AZOF**, on three sheets. With plans of the Bosphorus and strait of Kertch, Sulina harbour, Kustenjeh, Odessa, Balaklava, Burghaz, Varna, Soujak, Rizeh, Batoum, Trebizond, St. Douka, Ghelenjik, Gherzeh, Ounieh, Anapa, Samsoun, Kaffa, Amastra, and Sinoub. Accompanied with a Book of Directions. A beautifully engraved and elegant chart. ... 12/-
99. **SEA OF AZOF**. On two sheets. With plan of Kertch Strait ... 8/-  
On cloth for Captains' use ... 10/6

*Shipmasters bound to the Black Sea or Sea of Azof should provide themselves with charts Nos. 82, 83, 87, 94, 95, 96, 97, 98, 99, as they show the navigation on a very large scale.*

## *Newfoundland, Labrador, Gulf and River St. Lawrence.*

- 100. NEWFOUNDLAND.** On two large sheets. Drawn from recent English and French surveys. Accompanied with a Book of Directions ... .. 10/-
- 218. \*BANKS of NEWFOUNDLAND.** This chart shows the whole of the Banks from the Flemish Cap to the entrance of the Gulf of St. Lawrence. With plans of the principal harbours. On three large sheets. With a Book of Directions 12/-  
On cloth for Captains' use ... .. 15/9
- \* See also Nos. 107, 108, 207, which are on the same scale, one chart following the other.
- 101. SOUTH COAST of NEWFOUNDLAND.** On three large sheets. Compiled principally from recent surveys. This chart contains many plans of harbours, and shows the Banks in an accurate manner, on a very large scale, and will be found extremely useful to shipmasters engaged in the Quebec and Montreal trade. With a Book of Directions ... .. 12/-  
On cloth for Captains' use ... .. 15/9
- 102. COAST of LABRADOR (Strait of Belle Isle to Port Manvers).** On two large sheets. With plans of all the principal harbours. Limits: latitude 51° 30' to 57° 50' N., longitude 54° to 62° 30' W. ... .. 8/-  
On cloth for Captains' use ... .. 10/6
- Charts Nos. 100 and 102 are on the same scale, and are intended to accompany each other.
- 103. STRAIT of BELLE ISLE to CAPE COD (Gulf and River St. Lawrence, Newfoundland, &c.).** On three large sheets. This chart shows the Coast of North America between Belle Isle and Cape Cod, and includes, therefore, the island of Newfoundland, the gulf and river St. Lawrence, and coast of Nova Scotia. In it are plans of Halifax, Conception bay, strait of Belle Isle, St. Pierre, Harbour Grace, Cape Race, Cape Ray, &c. &c. Accompanied with a Book of Directions ... .. 12/-  
On cloth for Captains' use ... .. 15/9  
On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... .. 31/6
- 255. BELLE ISLAND to CAPE COD AND THE BANKS of NEWFOUNDLAND.** A large chart on three sheets, especially useful to Fishermen, as it shows the Flemish Cap, the most eastern known bank. With plans of harbours. Accompanied with a Book of Directions ... .. 12/-
- 104. GULF of St. LAWRENCE,** on two sheets, on a large scale, with plans of numerous harbours. Drawn chiefly from the recent surveys of Captain Bayfield, R.N. ... .. 8/-  
On cloth for Captains' use ... .. 10/6
- 105. GULF and RIVER St. LAWRENCE.** A large chart on three sheets, showing the navigation from the west coast of Newfoundland to Quebec. With many plans of harbours, and accompanied with a Book of Directions ... .. 12/-  
On cloth for Captains' use ... .. 15/9

The charts (Nos. 60, 101, and 105) show the navigation between Europe, the south coast of Newfoundland, and Quebec, on the largest scale yet published. Each chart is on three sheets.

## *East Coast of North America.*

- 106. NOVA SCOTIA, NEW BRUNSWICK, and COAST OF THE UNITED STATES to CAPE COD.** A large chart on three sheets. With plans of the harbours of Halifax, Fourchu, Yarmouth, Annapolis, Salem, Portland, Portsmouth, St. John, and of numerous anchorages on various parts of the coast. Illustrated with views of the coast ... .. 10/-  
On cloth for Captains' use ... .. 12/3

- 256. BAY OF FUNDY.** A large chart on two sheets. With plans of St. John harbour, river Petitcoudiac, Grand Passage, Digby Gut, Flag Cove, South-west Harbour and Somes Sound, Etang and Winter Harbours. Limits : latitude  $43^{\circ} 10'$  to  $46^{\circ} 8' N.$ , longitude  $63^{\circ} 15'$  to  $68^{\circ} 35' W$  ... 8/-  
On cloth for Captains' use ... 10/6
- 107. CAPE CANSO to NEW YORK and DELAWARE BAY.** A large chart on three sheets. With plans of the Coast in the vicinity of New York, Boston bay, and Portland harbour. Accompanied with a Book of Directions ... 12/-  
On cloth for Captains' use ... 15/9  
On cloth and rollers for Counting-house, coloured and varnished ; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6
- 108. NEW YORK and DELAWARE BAY to the STRAIT of FLORIDA.** On three large sheets. With plans of the most important harbours. Accompanied with a Book of Sailing Directions ... 12/0  
On cloth for Captains' use ... 15/9  
On cloth and rollers for Counting-house, coloured and varnished ; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6
- 207. NEW YORK TO KEY WEST, HAVANA, MATANZAS, NASSAU, &c.** On four large sheets, being the same chart as No. 108, but with an additional sheet to show the navigation through Florida strait. With a Book of Sailing Directions ... 14/-  
On cloth for Captains' use ... 19/-

NOTE.—The Charts (Nos. 218, 107, 108, or 207) are on the same scale, and one follows the other. They show the Navigation across the Banks of Newfoundland to the ports on the eastern coast of the United States. Vessels from Europe should be provided with chart No. 60, in addition to these publications.

- 28. COTTON PORTS OF CAROLINA and GEORGIA.** On three large sheets, showing the coast of the United States westward of cape Fear as far as St. Augustine. Compiled from recent surveys made by the United States Coast Surveyors. With a Book of Directions ... 12/0  
On cloth for Captains' use ... 15/9

NOTE.—This Chart shows the approaches to the principal Cotton Ports of the United States on a very large scale. It contains plans of St. Helena sound, Charleston, Bull bay, entrance to Savannah river, Doboy sound, &c.

## *West Indies, &c.*

- 109. BAHAMA ISLANDS and BANKS.** On  $2\frac{1}{2}$  large sheets. Showing the strait of Florida and adjacent coasts, with plans, on a large scale, of Key West, east part of Florida reef, Havana, Matanzas, New Providence, &c. Drawn from recent surveys. Accompanied with a Book of Directions ... 10/-  
On cloth for Captains' use ... 15/-
- WEST INDIES and COAST of COLOMBIA.** With plans, on a large scale, of the principal harbours contained within its limits. Compiled from recent British, French, American, and Spanish surveys. On four large sheets. Published in two parts, as follows :—
- 110. Strait of Florida and Gulf of Mexico, &c.** Showing all the coast and islands westward of longitude  $78^{\circ} 30' W.$  ... 8/-  
On cloth for Captains' use ... 10/6
- 110a. Strait of Florida to Panama and the Caribbee Islands.** Showing all the coast and islands eastward of longitude  $79^{\circ} 35' W.$ , and including the coast of Venezuela, &c. ... 8/-  
On cloth for Captains' use ... 10/6
- 111. GULF of MEXICO, and Islands of Cuba, Haiti, and Jamaica, the Caribbees, &c.** On four large sheets. Showing the Windward Passages on a large scale. Price 14/- ; or with a Book of Directions ... 18/-  
On cloth for Captains' use ... 23/-
- 2. GULF of MEXICO, and Islands of Cuba, Haiti, and Jamaica, being three sheets of Chart No. 111.** With a Book of Directions ... 14/-

113. **GULF of MEXICO. Chart No. I. (Tampa Bay to New Orleans).** On two large sheets, and containing plans of the harbours of Apalachicola, St. Andrew, Pensacola, Entrance to Mobile bay, and the Passes of the Mississippi. 8/-
114. **GULF of MEXICO. Chart No. II. (New Orleans to Tampico).** On three large sheets, and containing plans of the harbours of Galveston, Atchafalaya bay, Sabine Pass, Matagorda bay, Entrance to the Rio Grande, and Tampico. 10/-
250. **GULF of MEXICO. Chart No. III. (Tampico to Cape Catoche).** With plans of all the harbours contained within its limits—Vera Cruz, Miniatitlan, entrance to the Laguna de Terminos, &c. &c. On three large sheets 10/-
115. **BAY OF HONDURAS (Cape Catoche to Cape Gracias).** On two large sheets. With plans of the Approach to Belize, Turneffe cays, Chinchorro Bank anchorages, St. Thomas Bight, Hospital Bight, Port Cortez, Omoa, Coxen Hole (Roatan), East Harbour (Utilla), and Port Royal (Roatan). With a Book of Directions ... .. 8/-

These four charts, Nos. 113, 114, 250, and 115, are on the same scale, and intended to accompany each other.

116. **CARIBBEAN SEA. Showing the coast of the main land included between the Caribbee Islands and Cape Gracias.** On three large sheets. With plans of the harbours of Aspinwall, Barcelona, Cumana, Porto Cabello, Santa Anna, Sabanillo, La Guayra, Chagres, &c., &c. Drawn from recent British and Spanish surveys. Accompanied with a Book of Directions... 12/-

N.B.—See also charts Nos. 214, 215, 210, each of which is in two large sheets. These three charts comprise the same limits as this chart.

- 214.\* **CARIBBEAN SEA—Western Part (Cape Gracias to the Gulf of Darien and Fuerte Island).** On two large sheets, and containing plans of all the principal harbours. This chart shows the navigation between Cape Gracias, Jamaica, &c., and Panama. Limits: lat. 8° N. to lat. 18° 20' N., long. 75° 54' W. to long. 83° 55' W. ... .. 8/-

- 215.\* **NORTH COAST of SOUTH AMERICA (Gulf of Darien to Roques Islands).** On two large sheets, and containing plans of all the principal harbours. Limits: lat. 8° N. to lat. 15° 46' N., long. 66° 52' W. to long. 77° 20' W. 8/-

- 210.\* **CARIBBEE ISLANDS.** A large chart in two sheets. Compiled from recent surveys, and containing plans of the Dragons' Mouths, Serpent's Mouth, Port Spain (Trinidad); Bridgetown, South Point, Kilridge Point (Barbados); Scarborough (Tobago); Basseterre (St. Christopher); Orangetown (St. Eustatius); Port Royal bay (Martinique); Falmouth and St. John's (Antigua). Accompanied with a Book of Directions ... .. 10/-

\* See Note on page 18, below Chart No. 123.

117. **CARIBBEE ISLANDS.** Being one sheet of the Chart No. 111. An elegantly engraved chart ... .. 5/-

118. **CUBA.** On a very large scale, and with plans of all the principal harbours. Drawn from Spanish surveys. On two large sheets ... .. 8/-

Charts Nos. 109 and 118 are on the same scale.

119. **HAITI or SAN DOMINGO.** Compiled from recent surveys ... 5/-

270. **PORTS and HARBOURS in HAITI. Sheet I.** Miragoane bay; Juan Rabel anchorage; Samana bay; Port-au-Prince; Fond La Grange; Port Paix; Salt River and Chouchou bays; Manzanillo bay; Acul bay; Petit Goave bay; Gonaives bay; St. Mark bay; Fort Dauphin bay; St. Nicolas (La Mole) bay; Tiburon, Jeremie, and San Lorenzo bays; Port Plata; San Domingo; Tierra-Baja roadstead; Moustique bay; and Port à l'Ecu ... .. 5/-

271. **PORTS and HARBOURS in HAITI. Sheet II.** Approaches to Cayes; anchorage at Cayes; Cayes à l'eau anchorage; Cape Haiti harbour; Monte Christi; Cayemites bay; Port-au-Prince bay; Jaquemel harbour; Caldera bay; Trois Bay; Dame Maria bay; and Nayassa island ... ..

120. **PUERTO RICO and VIRGIN ISLANDS.** On two large sheets. With plans of St. Thomas' harbour, Road harbour, Gorda sound, South-east end of Culebra, Christianstaed, Mona island, Sombrero island, Guanica, Mayaguez, Ponce, and San Juan harbours. With a Book of Directions ... 8/-
121. **GUADELOUPE.** A chart of the island from French surveys. On a large scale. With plans of all the harbours ... 6/-
216. **ST. LUCIA.** A chart of the island from French surveys, on a large scale 6/-
219. **VIRGIN ISLANDS.** On one large sheet. From recent surveys. With a plan of the harbour of St. Thomas ... 5/-

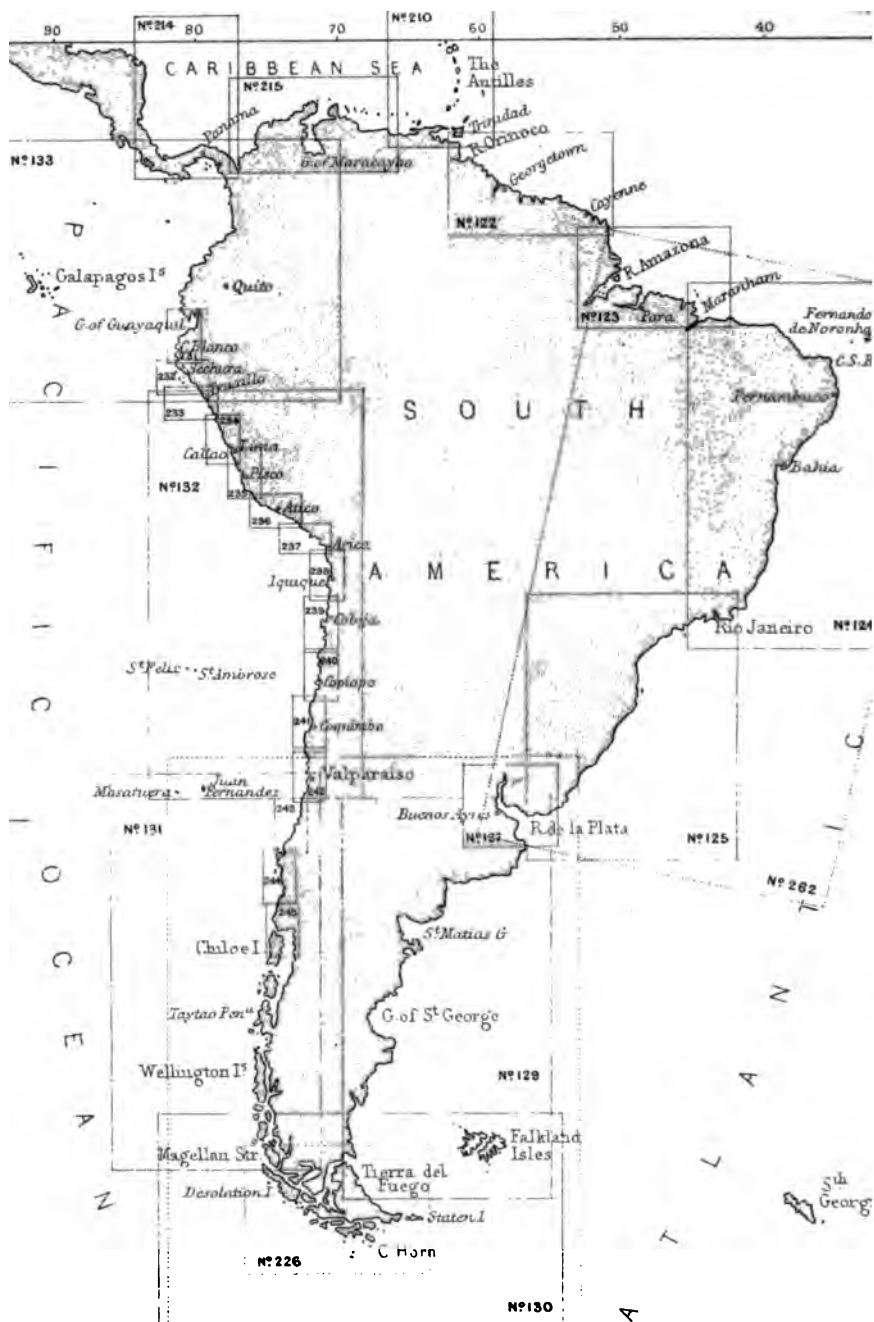
### *East Coast of South America.*

- 122\* **COAST of GUIANA, &c. (Trinidad to Cape Cachipour.)** Showing the various harbours and rivers of Demerara, Berbice, Cayenne, &c. Drawn from recent surveys. On two large sheets... 8/-  
On cloth for Captains' use ... 10/6
- 123\* **APPROACHES to the RIVERS AMAZONA, PARA, &c. (Cape Cachipour to Maranhão).** With plans of the River Para and Maranhão. Drawn from recent surveys ... 8/-  
On cloth for Captains' use ... 10/6

\* The five charts Nos. 214, 215, 210 (see page 17) 122, 123, are on the same scale, and show the navigation along the north coast of Central America, and South America from Cape Gracias and Jamaica, to Puerto Rico and Maranhão.

262. **COAST OF BRAZIL AND THE ARGENTINE CONFEDERACY.** A large chart on three sheets showing the navigation from the Amazona river to Monte Video and Buenos Ayres in the Rio de la Plata. With plans of Tutoia anchorage; Maranhão; Ceara; the Rocas reef; shoals off cape St. Roque; the river Pará; Pernambuco; Bahia; Santos; Ilheos anchorage; Cabral and Santa Cruz bays; Espirito Santo bay; coast in the vicinity of cape Frio; cape Frio harbour; Santa Catharina; banks off cape St. Thomé; Abrolhos reefs; Rio Grande do Sul; Maldonado and Lobos island; Rio de Janeiro; Monte Video; Paloma harbour and roadstead; and the anchorages at Castillo and Polonio. Compiled from recent surveys. With a Book of Directions ... 12/-  
On cloth for Captains' use ... 15/9
- 124.† **COAST OF BRAZIL (Maranhão to Cape Frio and Rio Janeiro).** On three large sheets. With plans of the most important harbours on the coast. Compiled chiefly from recent surveys made by M. Mouchez of the French Navy, and Don. A Vital de Oliveira of the Brazilian Navy. Illustrated with many views of the coast. Accompanied with a Book of Directions ... 10/-  
On cloth for Captains' Use ... 13/9  
On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6
- 125.† **COAST of BRAZIL (Cape Frio and Rio Janeiro to the River Plate).** On two large sheets. In this chart are given plans of the most important harbours, such as Rio Janeiro, Marambaya, Santos, Cananea, Rio Grande, Monte Video, cape Sta. Maria, &c., and there are explanatory notes which add considerably to its value. Compiled chiefly from recent French and British surveys. Accompanied with a Book of Directions ... 8/-  
On cloth for Captains' use ... 10/6
- † These two charts (Nos. 124 and 125) comprise the whole of the coast of Brazil, and are laid down upon the plain scale, not the diagonal.
126. **RIVER PLATE.** A large scale chart, on two sheets, showing the navigation to Monte Video and Buenos Ayres. With plans of Monte Video, Buenos Ayres, Maldonado, &c. Compiled from recent British, French, Spanish, and American surveys. With a Book of Directions ... 7/-  
On cloth for Captains' use ... 9/6





INDEX TO THE CHARTS.

## SOUTH AMERICA

\* The Numbers refer to the Catalogue.

of S<sup>th</sup> Shetlands.

N<sup>o</sup> 128

S<sup>th</sup> Orkney's

127. **RIVER PLATE and RIVERS PARANA and URUGUAY.** The same Chart as No. 126, but with a supplementary sheet showing the course of the Rivers Parana and Uruguay, from Buenos Ayres to Rosario and Paysandu. With a Book of Directions ... .. 10/0  
On cloth for Captains' use ... .. 13/9  
For the convenience of purchasers the Supplementary Sheet (Rivers Parana and Uruguay) is also supplied separately, price 4s.

## South and West Coasts of South America.

128. **SOUTH AMERICA (COAST of) from Rio de la Plata round Cape Horn to Valparaiso,** on three sheets. With plans, on a large scale, of Valdivia Bay, Ancud Bay, Stanley Harbour (Falklands), the Strait of Le Maire, and of Cape Horn, and the islands in its vicinity. Drawn from the surveys of Captains Fitzroy and King, of the Royal Navy. A beautifully engraved and accurate chart ... .. 12/-  
On cloth for Captains' use ... .. 15/9  
On cloth and rollers for Counting-house, coloured and varnished; size 6 ft. 5 in. by 3 ft. 5 in. ... .. 31/6
226. **STRAIT OF MAGELLAN, and COAST and ISLANDS OF CAPE HORN.** A Chart, on two large sheets, showing the navigation through Magellan Strait and also round Cape Horn. With plans of Harbours ... .. 8/-  
On cloth for Captains' use ... .. 10/6
- 129.\* **SOUTH AMERICA (Chart No. 1).** *Showing the navigation from Rio de la Plata to Magellan Strait and the Falkland Islands.* On three large sheets. With numerous plans of harbours. Limits: latitudes, 34° S. to 54° S.; longitudes, 54° 40' W. to 69° 30' W. ... .. 10/-  
On cloth for Captains' use ... .. 13/9
- 130.\* **SOUTH AMERICA (Chart No. 2), including Magellan Strait, the Falkland Islands and Coast round Cape Horn.** On three large sheets. With numerous plans of harbours. Limits: latitudes, 50° 30' S. to 59° S.; longitudes, 56° W. to 82° 20' W. ... .. 10/-  
On cloth for Captains' use ... .. 13/9
- 131.\* **SOUTH AMERICA (Chart No. 3), from Magellan Strait to Valparaiso.** On three large sheets. With plans of the harbours of Valparaiso, Concepcion, Valdivia, Cheneral, San Carlos, Barbara, Otway, &c. &c. Limits: latitudes, 53° S. to 32° S.; longitudes, 71° W. to 85° 50' W. ... .. 10/-  
On cloth for Captains' use ... .. 13/9
- 132.\* **SOUTH AMERICA (Chart No. 4), from Valparaiso to Truxillo.** On three large sheets. With plans of the harbours of Callao, Pisco Bay (Chinca Islands), Ilay, Papudo, Horcon, Quintero, Coquimbo, Atico, Huasco, Ylo, Arica, Valparaiso, &c. &c. Limits: latitudes, 34° S. to 8° S.; longitudes, 68° W. to 82° 50' W. ... .. 10/-  
On cloth for Captains' use ... .. 13/9
- 133.\* **SOUTH AMERICA (Chart No. 5).** *Showing the navigation between Truxillo and Panama.* On two sheets. With plans on a large scale of all the principal harbours ... .. 8/-  
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- \* These general Charts (Nos. 129, 130, 131, 132, and 133) are all new, and show the navigation from the River Plate round Cape Horn to Panama, on the largest scale yet published. They are very clearly and beautifully engraved, are all on the same scale, and no expense has been spared in their production.
231. **St. Helena Point to Sechura Bay, including the River Guayaquil.** With plans of all the harbours contained within its limits. Limits: latitude 2° 10' S. to 5° 40' S. ... .. 4/-
232. **Sechura Bay to Paycasmayo Bay.** With plans of Lambayeque Road, port Eten, and the islands Lobos de Tierra, Lobos de Afuera. Limits: latitude 5° 20' S. to 7° 40' S. ... .. 4/-

233. **Paycasmayo Bay to Port Chimbote.** With plans of the bays of Paycasmayo, Malabrigo, Huanchaco, and Santa, the Guanape islands, &c. Limits: latitude  $7^{\circ} 20'$  to  $9^{\circ} 30'$  S. ... 4/-
234. **Port Chimbote to Callao.** With plans of the bays of Chimbote, Samanca, Ancon, Supe, Casma, Huacho, Culebras, Chancay, and Guarmey. Limits: latitude  $9^{\circ} 10'$  to  $12^{\circ} 30'$  S. ... 4/-
235. **Callao to Port San Nicolas.** With plans of Callao, Chinca islands, Paraca bay, port Chilca, the channel within Gallan island, and Independencia bay. Limits: latitude  $11^{\circ} 50'$  to  $15^{\circ} 17'$  S. ... 4/-
236. **Port San Nicolas to Cornejo Point.** With plans of ports San Nicolas, San Juan, Atico, Lomas, Quilca, and the anchorage in front of Quilca. Limits: latitude  $15^{\circ} 0'$  to  $17^{\circ} 0'$  S. ... 4/-
237. **Cornejo Point to Cape Lobos.** With plans of ports Mollendo, Ilay, Arica, and Ylo. Limits: latitude  $16^{\circ} 40'$  to  $19^{\circ} 0'$  S. ... 4/-
238. **Cape Lobos to Cape Paquica.** With plans of Chipana, Patillos, Mexillon, and Pisagua bays; the anchorages of Pabellon de Pica and Iquique, &c. &c. Limits: latitude  $18^{\circ} 30'$  to  $22^{\circ} 0'$  S. ... 4/-
239. **Cape Paquica to Port Paposo.** With plans of the anchorages of Algodon, Cobija, Angamos, Constitucion, Chimba, Antofagasta, and El Cobre. Limits: latitude  $21^{\circ} 50'$  to  $25^{\circ} 10'$  S. ... 4/-
240. **Port Paposo to Herradura Bay.** With plans of Carissals, Taltal, Paposa, Copiapo, Pajonel cove, Herradura, Chaferral, and Tortoralillo bays, Caldero, Yngles, Flamenco, and Lavata bays. Limits: latitude  $25^{\circ}$  S. to  $28^{\circ} 10'$  S. ... 4/-
241. **Herradura Bay to River Limari.** With plans of Huasco, Coquimbo, and Herradura bays, Tongoy bay, Chaferral island and bay, Peña Blanca, Choros and Apollado bays. Limits: latitude  $28^{\circ}$  S. to  $31^{\circ}$  S. ... 4/-
242. **River Limari to Toro Point.** With plans of Valparaíso bay, Lagunilla bay, port Papudo, Quintero bay, Maytencillo cove, Pichidangué bay, Algarrobo bay, Ligua roadstead, Conchali bay and neighbouring coast, Chigualoco bay, port San Antonio, &c. Limits: latitude  $30^{\circ} 50'$  S. to  $33^{\circ} 49'$  S. ... 4/-
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245. **River Yenellenchico to Port San Carlos.** With plans of Port San Carlos (Ancud), Valdivia, Queule bay, Tolten river, Lamehuapi cove, Condor cove, Muicolpue cove, San Pedro bay, Ranu cove, and Milagro cove. Limits: latitude  $39^{\circ} 0'$  S. to  $41^{\circ} 52'$  S. ... 4/-

\* These charts (No. 231 to No. 245) comprise the coast of South America from the river Guayaquil to Port San Carlos. They are all on the same scale (about  $11\frac{1}{2}$  inches to a Degree of Longitude), and from the most recent English, Chilean, and French surveys, and each contains plans of the harbours contained within its limits, and Sailing Directions for making the ports.

## *West Coast of North America.*

134. **WEST COAST OF AMERICA.—Panama to San Blas.** On three large sheets. With plans of the harbours of Sihuatanejo, Acapulco, Guatulco, San Carlos, Realejo, Salinas, Culebra, Punta Arenas, Arenitas, San Blas, &c., &c.; and illustrated with some views of the coast. Drawn from the most recent surveys 12/-  
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137. **North Pacific Pilot (Part 1).** A Sailing Directory for the West Coast of North America, between Panama and Queen Charlotte Islands, including Port Simpson and Sitka Sound. With numerous plans of harbours. New and enlarged Edition (1882). Intended to accompany the Charts Nos. 134, 135, and 136. By James Frederick Imray, F.R.G.S. ... 12/-

## *West Coast of Africa.*

211. **GIBRALTAR STRAIT to MOGADOR, &c.** A large chart on two sheets, showing the navigation from the south coast of Spain to the ports on the north-west coast of Africa. With plans of Mogador, El Araish, Dar-el-Beida (Casa Blanca), Mazaghan, Mehediyah, Rabat, Safi, and Agadir; also of Cape Spartel. Limits: latitudes  $30^{\circ}$   $\phi$  and  $37^{\circ}$   $30'$  N.; longitudes  $5^{\circ}$   $\phi$  and  $11^{\circ}$   $50'$  W. ... 8/-  
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272. **GIBRALTAR STRAIT to RIVER OURO, including Madeira and Canary Islands.** With plans of Mogador, El Araish, Dar-el-Beida (Casa Blanca), Mazaghan, Mehediyah, Rabat, Safi, Agadir, Ouro river, &c. &c. On two large sheets. Limits: latitudes  $39^{\circ}$  N. and  $23^{\circ}$  N., longitudes  $19^{\circ}$   $30'$  W. and  $5^{\circ}$   $20'$  W. ... 8/-
273. **RIVER OURO to SIERRA LEONE, including Cape Verde Islands.** With plans of Portendik, Goree, Sierra Leone, &c. &c. On two large sheets. Limits: latitudes  $24^{\circ}$  N. and  $6^{\circ}$   $20'$  N., longitudes  $26^{\circ}$   $10'$  W. and  $12^{\circ}$  W. ... 8/-
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Charts Nos. 272, 273, 72, 258, 259, are on the same scale, one following the other. These five charts show the whole of the West Coast of Africa from Gibraltar Strait to the Cape of Good Hope on a large scale.

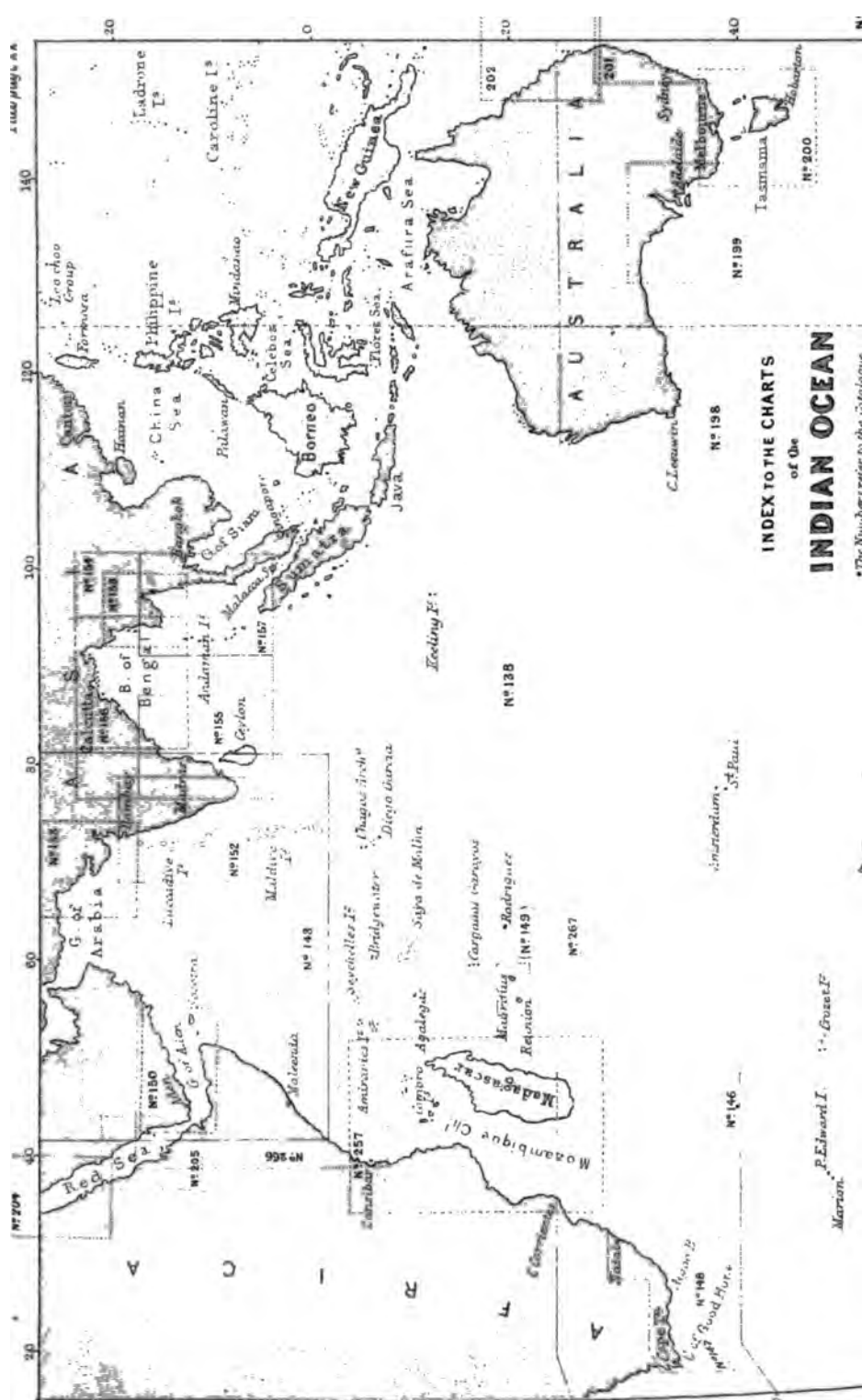
## *South and East Coasts of Africa.*

147. **COAST of CAPE COLONY (Table Bay to Algoa Bay).** On two large sheets. With plans of Table bay, Knysna harbour, Mossel bay, the coast about Danger point and Dyer island, Cape Agulhas, Plettenberg bay, Great Fish river, False bay, and Simons bay. Compiled from recent British surveys. Illustrated with views of the coast ... 8/-  
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148. **COAST of CAPE COLONY (Table Bay to Port Natal).** The same chart as No. 147, but with an additional sheet, showing the coast from Great Fish river to Port Natal. It consequently contains all the plans of harbours in that chart, and in addition there are plans of Bird islands, Algoa bay, port Natal, Kowie and Buffalo rivers. Accompanied with a Book of Directions ... 10/-  
On cloth for Captains' use ... 13/9  
This Chart shows the coast of the Cape Colony on a large scale.
146. **SOUTHERN AFRICA.** A chart on three sheets showing the navigation round the Cape Colony to Delagoa bay and Mozambique channel. With plans of Table bay, the Breakwater and Docks at Table bay, Mossel bay, port Natal, Delagoa bay, port Nolloth, Hondeklip bay, Saldanha and St. Helena bays, Dassen island, Kow'e river, Roodewall bay, McDougall harbour, Simons bay, port Elizabeth (Algoa bay), the Bird islands (Algoa bay), and the coast between the Cape of Good Hope and Struys bay. Limits: latitude  $24^{\circ}$  S. to  $40^{\circ}$  S., longitude  $16^{\circ}$  E. to  $46^{\circ}$  E. With a Book of Directions... 10/-  
On cloth for Captains' use ... 13/9
257. **MOZAMBIQUE CHANNEL.** A large chart on two sheets, showing the east coast of Africa between Delagoa bay and Zanzibar; also the whole of Madagascar, and the intermediate islands. With plans on a large scale of Zanzibar channel, Mozambique harbour, Latham island, and several of the most important anchorages in the Comoro islands. Limits: latitude  $27^{\circ}$  to  $3^{\circ} 20'$  S., longitude  $32^{\circ} 30'$  to  $51^{\circ} 30'$  E. ... 8/-  
On cloth for Captains' use ... 10/6
266. **ZANZIBAR TO THE RED SEA.** With plans of the most important harbours on the coast, comprising Durnford, Mombaza, Kisimayu, Brava, Meurka, Magadoxa, Berbereh, Ras Hafun, Cape Guardafui, south coast of Abd-al-Kuri, and Aden. Limits: lat.  $7^{\circ} 0'$  S. to  $17^{\circ} 30'$  N.; long.  $38^{\circ} 30'$  to  $57^{\circ} 30'$  E.—the chart consequently includes the Seychelle islands ... 8/-

Charts Nos. 146, 257, 266, are on the same scale, and follow each other. Shipmasters bound from the Cape of Good Hope to Delagoa bay, Mozambique, Zanzibar, or Aden, will find them very useful publications.

## *Indian Ocean, &c.*

138. **INDIAN OCEAN (Cape of Good Hope to Bombay, Madras, Calcutta, and St. George's Sound, Australia).** The limits of the chart are latitudes  $27^{\circ}$  N. and  $50^{\circ}$  S.; longitudes  $15^{\circ}$  E. and  $124^{\circ}$  E. On two large sheets. Compiled from recent surveys. Improved by many remarks on the tidal phenomena, currents, winds, &c. ... 8/-
139. **INDIAN OCEAN.** On three large sheets. The same chart as No. 138, but with an additional sheet (No. 144) containing plans of the principal islands, the Maldivh, Chagos, Seychelle groups, &c. ... 10/-  
On cloth for Captains' use ... 13/9  
On cloth and rollers for Counting-house, coloured and varnished ... 31/-



INDEX TO THE CHARTS  
of the  
**INDIAN OCEAN**

\*The Numbers in the Columns

P. Edward I. Goulet  
Marian.



140. **INDIAN and PACIFIC OCEANS.** The same chart as No. 138, with the addition of a sheet, to show the coasts of Australia, New Zealand, China, and the Philippine Islands. The limits of the chart are latitudes  $27^{\circ}$  N. and  $50^{\circ}$  S. ; longitudes  $15^{\circ}$  E. and  $178^{\circ}$  E. With a Book of Directions (No. 145)... 12/-  
On cloth for Captain's use ... 15/9  
On cloth and rollers for Counting-house, coloured and varnished ; size 6 ft. 5 in. by 3 ft. 5 in. ... 31/6
141. **INDIAN and PACIFIC OCEANS.** A chart for the use of shipmasters bound to Australia, who may intend to sail on the arc of the Great Circle. In this chart the best routes are laid down, and the Great Circle Tracts from the Cape of Good Hope to Australia are also shown. Limits : latitudes  $27^{\circ}$  N. to  $62^{\circ}$  S. ; longitudes  $15^{\circ}$  E. to  $178^{\circ}$  E. With a Book of Directions (No. 145) 14/-  
On cloth for Captains' use . . . 29/-
142. **INDIAN and PACIFIC OCEANS.** A chart showing the navigation eastward of the Cape of Good Hope to Australia and China, or between latitudes  $27^{\circ}$  N. and  $50^{\circ}$  S. ; longitudes  $15^{\circ}$  E. and  $178^{\circ}$  E. With a sheet of plans of the detached groups of islands so profusely scattered over the Indian Ocean. On four large sheets. With a Book of Directions (No. 145) ... 16/-  
On cloth for Captains' use ... 21/-
143. **ARABIAN SEA.** A large chart (on two sheets) of the Indian Ocean comprised between the Red Sea, the Gulf of Persia, and the coasts of India and Ceylon. It consequently shows the navigation between Aden, Karachi, Bombay, Colombo, and Point de Galle ... 8/-  
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144. **ISLANDS, &c., in the INDIAN OCEAN.** On one sheet. Being the additional sheet referred to in No. 139. The plans are Maldivh, Chagos, Seychelles, and Lakdivh groups of islands ; Comoro Islands ; Kerguelen Island ; St. Paul Island ; Cocos Islands ; Mahé in Seychelles ; and Christmas Harbour in Kerguelen Island. All are on a very large scale ... 5/-  
On cloth for Captains' use ... 6/3
145. **Short Notes on the Winds, Weather, and Currents of the Indian Ocean,** together with general Sailing Directions for and Remarks on making Passages ; with two charts showing the Currents and Tracks through the Ocean. A pamphlet intended specially to accompany the chart of the Indian Ocean. By W. H. Rosser ... 2/6
267. **ISLANDS EASTWARD OF MADAGASCAR.** Limits : lat.  $3^{\circ}$  S. to  $27^{\circ}$  S. ; long.  $46^{\circ}$  to  $65^{\circ}$  E. With plans of Seychelle islands, Farquhar islands, Tromlin island, Rodriguez, port Victoria (Mahé, Seychelles). Tamatave, Foule point, Fenoarivo (Madagascar). The chart shows the navigation between the Seychelle Islands, Mauritius, Réunion, Rodriguez, and the east coast of Madagascar.
- Note.*—Charts Nos. 146, 257, 266 (page 22 in the Catalogue) and Chart 267 form a series of charts for the navigation of the western part of the Indian Ocean, from the Cape of Good Hope to the Red Sea, and are all on the same scale. They are from the most recent surveys. In connection with them, the Indian Ocean Pilot (see page 33) should be taken.
149. **MAURITIUS and RÉUNION.** On two large sheets. With plans of port Louis ; the north-west coast of Mauritius ; the north coast of Mauritius ; St. Denis ; St. Benoit ; St. Rose ; St. Gilles ; St. Pierre ; and St. Paul—briefly, all the important anchorages in each island. Compiled from recent British and French surveys. With a Book of Directions ... 8/-  
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150. **GULF of ADEN (Socotra Island to the Red Sea).** With a plan of Aden. Illustrated with views of the land. On a large sheet. Drawn from recent surveys ... 5/-
- 204.\* **RED SEA (North Part).** A large chart on two sheets. With plans of the Strait of Jubal, Tor harbour, Kosair anchorage, Jiddah, the Brothers islets, Suez bay, the harbours of Sherm Wej'h, Sherm Yahar, Sherm Joobtah, Yenbo, Sherm Rabigh, and Sherm Ilasseyy ... 8/-

- 205.\* **RED SEA (South Part).** A large chart on two sheets. With plans of the harbours of Lith, Jelajil, Kunfidah, Gizan, Loheyyah, Ras el' Askar, Farisan island, Khor Nohud, Mersa Ar-rakiyah, Kamaran bay, Village bay (Disei island), Sawakin, Khor Nowarat, Hodeidah, Jebel Zukur island, Mokha roadstead, Perim island and harbour, Hamish islands and Bab-el-Mandeb Small strait
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\* These charts are on a very large scale. Each contains plans of all the surveyed harbours and anchorages within its limits.

151. **GULF OF SUEZ.** A chart on a large scale of the upper (the northern and most dangerous) part of the Red Sea. It accompanies that of the Suez Canal No. 92, and should be used in conjunction with charts Nos. 227, 92, 204, 205, as these charts show the navigation from the Mediterranean to the Gulf of Aden in a very satisfactory manner
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152. **INDIA (West Coast of), from Cape Comorin to Bombay.** On two large sheets. With plans of Bombay, Tudri river, Vingorla roadstead and rocks, Malwan bay, Chaul Kadu reefs, Sedashigur bay, Chitlac island, Kiltan island, St. Mary islands and rocks, Goa and Marmagao roadsteads, Raj-puri river, Narakel anchorage, Kolachel roadstead, Rajapur bay and Viziadurg harbour, Ratnagiri bay, Alippee roadstead, Enciam rocks, Cochin harbour, Calicut roadstead and Bey pore river
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- 155.\* **BAY of BENGAL. (West part of,—Chart No. 1).** On two large sheets. This chart shows the coast from Cape Comorin to Cocanada, and includes Ceylon. With plans of Bassas Reefs, Colombo, Point de Galle, Trincomalie, Madras, Pondichéry, Cocanada, Paumben Pass, &c. &c. Limits of chart, latitudes  $4^{\circ} 46'$  to  $17^{\circ} 30' N.$ ; longitudes  $76^{\circ} 30'$  to  $86^{\circ} 45' E.$
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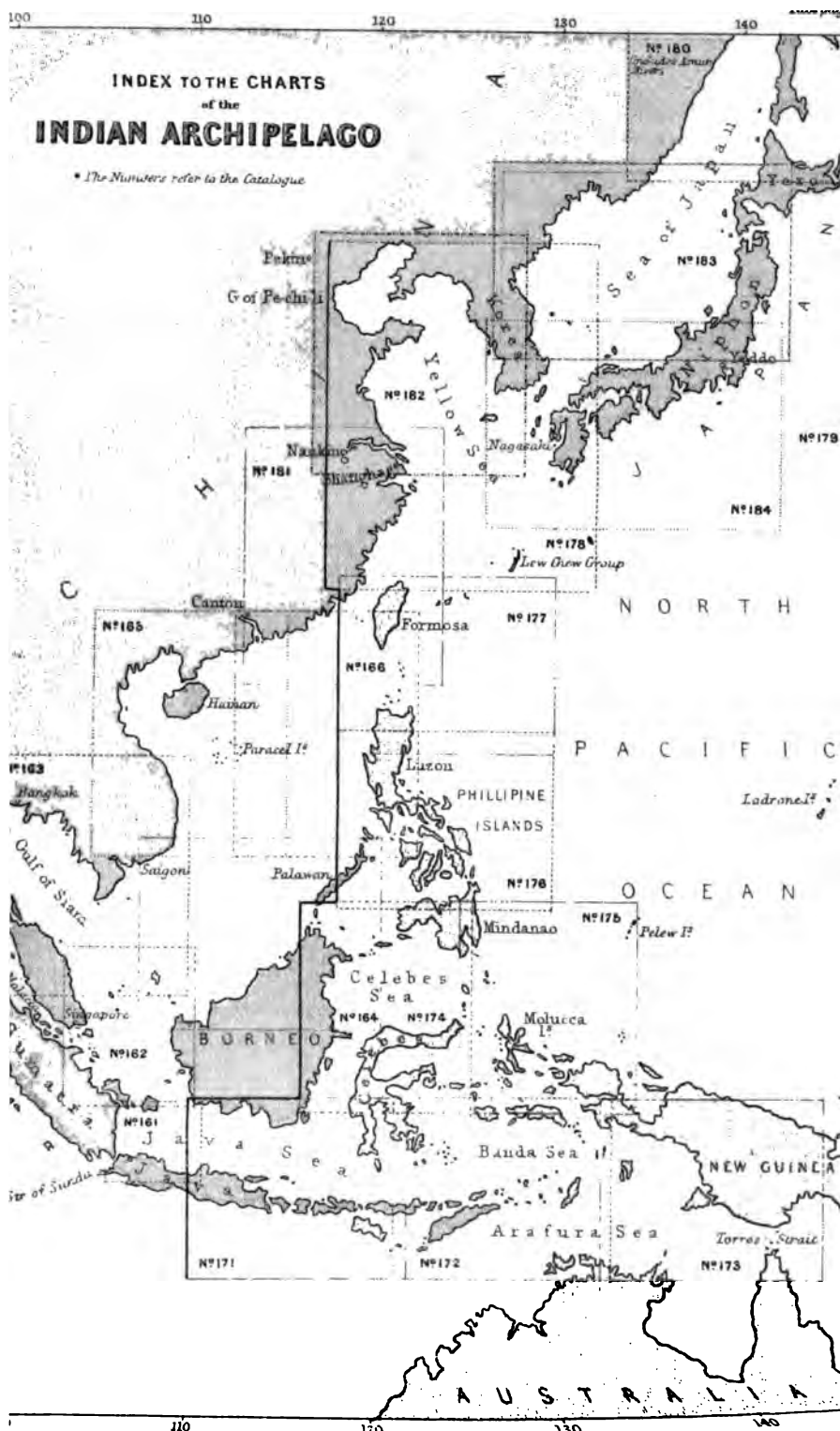
- 156.\* **BAY of BENGAL (North part of,—Chart No. 2).** On two large sheets. This chart comprises the coast between Pulicat and Bassein River. With plans of Akyab, Bassein River, Kyou Phiouk, &c. &c. Limits of chart, latitudes  $13^{\circ} 10'$  to  $23^{\circ} N.$ ; longitudes  $82^{\circ}$  to  $95^{\circ} E.$
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- 157.\* **BAY of BENGAL (East Coast of,—Chart No. 3).** On two large sheets. This chart includes the coast between Bassein River and Penang, the Andamans, Nicobars, north coast of Sumatra, &c. With plans of the principal harbours. Limits of chart, latitudes  $4^{\circ} 46'$  to  $17^{\circ} 30' N.$ ; longitudes  $91^{\circ}$  to  $101^{\circ} 20' E.$
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\* These three charts (Nos. 155, 156, and 157) include the whole of the Bay of Bengal, and are on a larger scale than any hitherto published. They form an invaluable series of charts for the use of Traders in the Bay.

158. **RICE PORTS of INDIA.** A chart, on two large sheets, of the east coast of the Bay of Bengal, between latitudes  $13^{\circ}$  and  $21^{\circ} N.$ , longitudes  $92^{\circ}$  and  $98^{\circ} E.$  With plans of Akyab, Kyou Phiouk, Bassein River, Rangoon River, Maulmain, and Kalgouk Island anchorage. A very useful chart for shipmasters bound to Akyab, Rangoon, or Maulmain, as it exhibits the navigation on a larger scale than any hitherto published
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(All these charts of the Bay of Bengal (Nos. 154 to 158) are new publications. The publishers feel confident that better or more useful charts cannot be obtained, as resort has been made to every available official survey, and no expense has been spared in their production.)





159. **BAY OF BENGAL PILOT.** A nautical description of the coasts and islands included within the Bay of Bengal. Intended to accompany the charts of the Bay. With plans of many of the most important harbours. This work contains the official instructions for making and entering the various harbours. By James F. Imray, F.R.G.S. ... 8/-

## *East India Archipelago.*

160. **EAST INDIA ARCHIPELAGO**, on two sheets. Being a general chart of all the islands composing the Archipelago of the India and China Seas. A track chart, and not intended for navigation purposes; the scale being too limited for insertion of the Reefs with the necessary accuracy. 8/-  
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- 161.\* **EAST INDIA ARCHIPELAGO (Western Route to China,—Chart No. 1).** Limits, latitudes  $2^{\circ} 50'$  and  $7^{\circ} 10'$  S., and longitudes  $105^{\circ} 30'$  and  $110^{\circ} 50'$  E. ... 7/6
- 162.\* **EAST INDIA ARCHIPELAGO (Western Route to China,—Chart No. 2).** Its limits are, latitudes  $3^{\circ} 0'$  S., and  $5^{\circ} 40'$  N., and longitudes  $103^{\circ} 20'$ , and  $110^{\circ} 20'$  E. ... 7/6
- 163.\* **EAST INDIA ARCHIPELAGO (Western Route to China,—Chart No. 3).** Limits, latitudes  $3^{\circ}$  N. to  $16^{\circ} 20'$  N., and longitudes  $99^{\circ} 20'$  to  $110^{\circ}$  E. 7/6
- 164.\* **EAST INDIA ARCHIPELAGO (Western Route to China,—Chart No. 4).** Limits, latitudes  $1^{\circ} 20'$  to  $11^{\circ} 52'$  N., and longitudes  $107^{\circ} 20'$  to  $120^{\circ} 40'$  E. ... 7/6
- 165.\* **EAST INDIA ARCHIPELAGO (Western Route to China,—Chart No. 5).** Limits, latitudes  $10^{\circ} 50'$  and  $23^{\circ} 40'$  N., and longitudes  $104^{\circ} 45'$ , and  $115^{\circ} 20'$  E. ... 7/6
- 166.\* **EAST INDIA ARCHIPELAGO (Western Route to China,—Chart No. 6).** Limits, latitudes  $10^{\circ} 50'$  and  $23^{\circ} 40'$  N., and longitudes  $112^{\circ} 10'$ , and  $122^{\circ} 45'$  E. ... 7/6

\* These charts (Nos. 161 to 166) of what is popularly known as the Western Route to China, exhibit the navigation from Sunda Strait to the Coast of China on a very large scale. Each consists of two sheets; the set, therefore, comprises twelve sheets. They have been compiled from the most recent British, French, Dutch, and Spanish surveys. In several of the charts there are notes descriptive of the currents, winds, &c., and remarks upon the courses most advisable to follow at certain periods of the year. If mounted on cloth for Captains' use, the price of each will be *as. 6d. extra*. An Index Chart accompanies the set.

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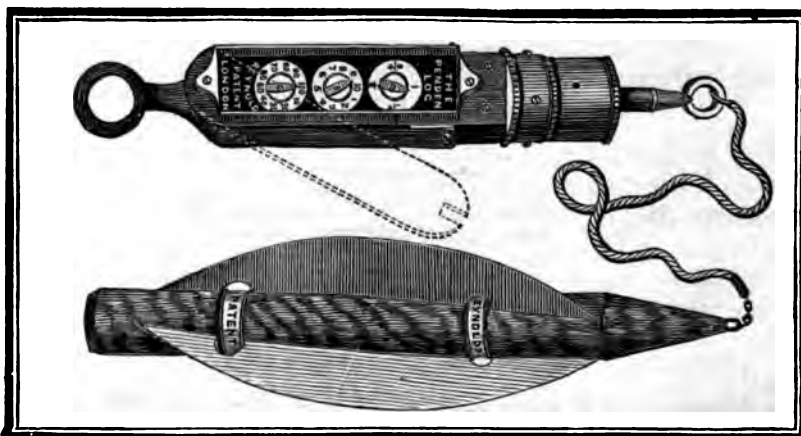
<b>Double Glasses, especially adapted to the use of Captains and Pilots, &amp;c., at night</b>						£2 2s. to	5	10	0
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<b>Log Glasses, 14 and 28 seconds, common</b>						each	0	1	6
" In brass frame							0	2	6
" Half-hour solid Glasses							0	2	6
" One-hour ditto							0	4	6
" Two-hour ditto							0	5	0

	£	s.	d.
Bar and Compound Magnets ... .. from 15s to	2	2	0
Tape measures, from one pole to six poles in length, divided for land surveying, or the measurement of timber, in leather boxes, &c., 6s. to	0	15	0
Brass Speaking Trumpets ... .. from 5s. 6d. to	0	18	0
Storm Glasses, or Prognosticators ... .. from 6s. 6d. to	0	14	6
Steel Joint Dividers, 4, 5, 6, 7, and 8 in. ... .. per dozen, 12s. to	1	10	0
„ with Shifting Leg ... .. £1 10s. to	3	0	0
Brass Joint Dividers, 4, 5, 6, 7, and 8 in. ... .. per dozen, 9s. to	0	18	0
„ with Shifting Leg ... .. 18s. to	1	16	0
Compasses with Pen and Pencil Points, and Box Scale, in case. ... ..	0	4	6
„ with Steel Joints ... ..	0	6	6
Set of Instruments, with Scale, in Fish-skin case ... ..	0	8	6
„ with Steel Joints ... ..	0	10	6
„ and Bow Pen ... ..	0	12	6
„ Steel Joint Instruments, with Bow Pen, Ivory Scale, Sector, and Brass Protractor ... .. 7s. 6d., 12s., 16s., and	1	2	6
„ Turned Check Instruments, and Ivory Protractor ... ..	1	15	0
„ Round Shank ditto, with Lengthening Bar ... ..	2	2	0
Ebony Parallel Rules, 6, 9, 12, 15, 18, 21, and 24-inch ... .. from 1s. to	0	4	0
Two-foot Box Gunter's Scales ... ..	0	2	0
„ improved by Don ... ..	0	5	0
„ Sliding Gunter's Scale ... ..	0	7	6
10, 12, 15, 18, and 21-inch Globes, in black frames ... .. from £2 12s. 6d. to	10	10	0
„ in high mahogany frames ... .. from £4 4s. to	21	10	0

### REYNOLDS' PENDENT LOG.

In the use of this excellent instrument the vane or rotator only is thrown overboard, the other part of the instrument being suspended to the ship's side. It is reported to register with remarkable accuracy. Price £3 3s.



# MARINE ODOMETER.

Reynolds' Patent.

An instrument for measuring the speed of a vessel's passage through the sea.



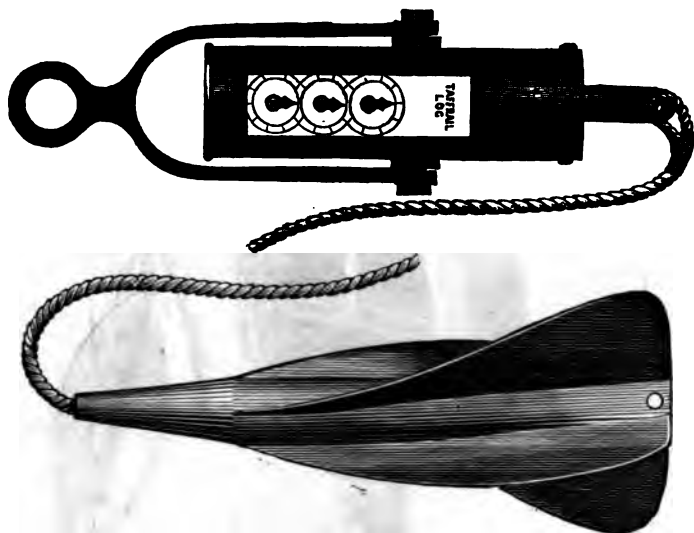
*Note.*—THE FOLLOWING ARE SOME OF THE SPECIAL ADVANTAGES THE ODOMETER POSSESSES OVER THE ORDINARY PATENT LOG :—

1. As the Register is fixed on the Ship's quarter rail, it is ready to be referred to at any time without the trouble of hauling in.
2. The Propeller alone being towed in the water, is the only part at all likely to be lost ; and as it is made exceedingly strong and cheap, the instrument is *most economical* as regards its ultimate cost.
3. Should the Propeller at any time become detached, it is immediately detected by the instrument ceasing to Register ; thus avoiding the danger that might result from the loss of an ordinary Log when being relied upon for distance.
4. The utmost care and attention being bestowed upon the manufacture, ensures its durability. The only care required is to keep the back part and spindle well oiled.
5. It is an established fact that all Logs vary in their results, according to the speed with which they are drawn through the water ; also ships not being alike in build, leave different wakes behind them : hence a Log which gives a correct distance with one ship, will be fast or slow with another. Errors arising from either of these causes can be corrected by simply allowing more or less line, as per instructions furnished with each instrument.

THESE INSTRUMENTS are now used by all the Telegraph Cable Ships, a great many of the principal Steam Ship Companies and firms in London and Liverpool, and by the Indian and Brazilian Government Ships.

Price with Rotator, Clamp and Bracket Pieces, &c., complete, £5 5s.

## BLISS & CO.'S PATENT TAFFRAIL LOG.



The following are some of the special advantages found in using the Taffrail Log.

**FIRST.** The dial of the Log can be easily inspected at all times, which is particularly convenient when changing the course of the vessel; the necessity of hauling in being avoided.

**SECOND.** The register is secured on board, and consequently is easily accessible. The rotator only is overboard. The strain upon the line is about one-quarter of that of the submerged Log, which is variously estimated at forty or fifty pounds, sufficient to decrease the speed of the vessel to some extent: besides, the greater strain often causes the breakage of the line and the loss of the entire Log.

**THIRD.** This Log will be found, ultimately, the cheapest, because only the rotator is exposed to danger of loss, and when lost, can be replaced at trifling cost.

**FOURTH.** The substantial manner in which these Logs are made, and the fact that the registering apparatus is not exposed to the action of salt water, may be taken as a guarantee that they will last far longer than is possible with any submerged Log.

**FIFTH.** The liability of having the Log ruined, or at least disabled, when crossing shoals, by striking the bottom, or being filled with sand, is avoided.

**SIXTH.** The state of the Log being readily seen, prevents the danger of over-running a given distance when on any course.

**SEVENTH.** Fouling with sea weed is avoided by the gradual taper of the blades, and the freedom from obstructions, such as knots or eyes.

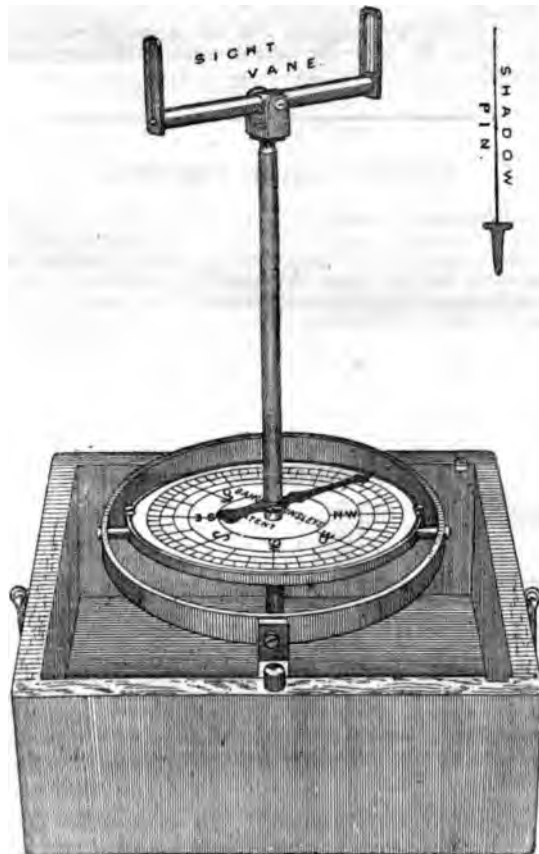
**EIGHTH.** This Log will indicate accurately at a lower speed than any submerged Log, because there is less slip, owing to the spiral form of the blades of the rotator.

**NINTH.** The greater part of the damage caused by hauling in is avoided in this Log, as that is so seldom required: besides, the blades being spiral are much stronger.

Price (complete with line) ... ..	£4 10 0
Rotator (if sold separately) ... ..	0 15 0

## BAIN AND AINSLEY'S COURSE INDICATOR.

This instrument is extremely simple in construction. Any one possessing ordinary intelligence can use it. By it the Deviation of the Compass can readily be ascertained in all latitudes from observations of the sun or stars ... .. £5 10 0



**TOOVEY'S AZIMUTH DIAL.**

This instrument, for determining the *error* of the Compass (*variation* and *deviation* combined) at sea, is a modification of what is called the Dumb Card ; it is used in connexion with Godfray's *Time Azimuth Chart*, and the two will be found very useful auxiliaries to all who are in command of iron ships and steamers. Price, with tripod stand ... .. £5 10s.

**PATENT SELF-REGISTERING LOGS.**

	£	s.	d.
Bliss & Co.'s (New York) Taffrail Log ... ..	4	10	0
Walker's Taffrail ... ..	4	10	0
Massey's ... ..	2	10	0
„ Propeller Log ... ..	3	3	0
Reynolds' Pendent Log ... ..	3	3	0
„ Odometer (a self-registering Log, with the apparatus fixed on the quarter rail of the Ship—the vane or rotator only being thrown overboard) ... ..	5	5	0

**PATENT LIQUID COMPASS.**

The Card or Dial consists of a metal plate floated, by means of air-vessels, in liquid ; it is perfectly steady under any amount of vibration, or pitching, or rolling of the Vessel, and at the same time is as quick in its action as the lightest compass ; and it is guaranteed to remain so on the longest voyage ; it is equally as sensitive in fine weather as in heavy, and, although especially applicable to steamers, in which the vibration has heretofore been a great detriment in ascertaining the true course made, it is no less useful in a sailing vessel.—For steam-boats it is superior to all other Compasses in use. Size of Card, 6, 7½, 9, and 10 inches ... .. from £4 10s.

**PATENT SOUNDING MACHINES.**

	£	s.	d.
Walker's (Birmingham) ... ..	2	5	0
Massey's ... ..	3	10	0

**LANTERNS, BELLS, AND FOG-HORNS.**

Lamps for Sailing and Steam-vessels fitted up according to the New Regulations of the Board of Trade. These are of various sizes and patterns, and can be had either in tin (japanned) or in copper. Those with reflecting dioptric lenses are strongly recommended, as they give light of unusual brilliancy, and are but little more expensive.

Bells and Fog-Horns are kept in stock, as the Regulations oblige vessels to carry them for use in thick weather. They are of various sizes and prices.

## Atlases.

THE following Atlases, published by Messrs. G. PHILIP and SON, contain all recent geographical discoveries. The maps are elegantly and clearly engraved, and the system of colouring adopted very much increases their usefulness. Being publications of considerable excellence, we recommend them with confidence :—

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